REPORT OF THE PANEL ON
OILS AND SOAPS INDUSTRIES
Department of Industries and
Supplies.

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GOVERNMENT OF INDIA

DEPARTMENT OF INDUSTRIES AND SUPPLIES

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REPORT OF THE PANEL

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GOVERNMENT OF INDIA

DEPARTMENT OF INDUSTRIES AND SUPPLIES

REPORT ON OILS.

1. **Vegetable Oils and Fats.**—The importance of oil seeds to the agricultural and industrial economy of India cannot be over-emphasised, they are not only important articles of food for man and animal, but also essential raw materials for important industries such as soaps, toileties and glycerine, paints and varnishes refined edible oils and vegetable ghee, lubricants etc.

2. India is one of the principal oil-seeds producing countries of the world and has occupied hitherto a significant position in the oil seed trade. The prominent place which oil seeds occupy in the agricultural economy of India including Indian States can be realised from the fact that nearly 8 p.c. of the total net area under cultivation or about 23 million acres—are used for oil-bearing crops. The annual production of about 7 million tons of oil seeds,worth 240 crores of rupees, includes groundnut, rape and mustard, linseed, sesamum, copra, castor, cotton seed, mhowa, etc. Until very recently India contributed a substantial share in the world trade of oil seeds; being essentially an agricultural country and with lack of any significant industrial development a large proportion of the oil seeds grown in India used to feed the markets of the world. Up to 1913-14, India, for instance, was the principal source of supply of copra to the markets of the world; this position she has, however, lost in recent years due to the growing demand in India itself for cocoanut oil for industrial and domestic uses and from an exporter she has become a prominent importer of copra and cocoanut oil, chiefly from Ceylon and Federated Malay States. Similarly, her castor crop was almost entirely grown for the export trade whilst substantial quantities of groundnut linseed and sesamum also found a ready export market in the absence of any wide scale domestic use. A decade ago over a million and a half tons of oil seeds used to be exported from India; in recent years with the growing industrialisation of the country, this export is steadily declining and in fact there is a shortage of certain oils in the country, to wit cocoanut oil. The shortage of cocoanut oil is a pointer to the likelihood of similar shortages being felt in other oils if industrialisation is to proceed apace and the standard of living in the country is to go up. We believe there is considerable scope for the expansion of the oil seed industry, and also for increased output per acre, by improved and modern agricultural methods.

3. The Nutrition Advisory Committee has recently recommended that the minimum per capita consumption of fats in India should be atleast 2 oz. per day. The existing per capita consumption is only 8 lbs. per year or 0·35 oz. per day for edible purposes. On the basis of 2 oz. per day the requirement of the country would work out to 11,000 tons of oils and fats per day, taking only half the population of India into consideration. In terms of edible oil seeds consumed in India at present, like copra, groundnuts, sesamum, rape and mustard, (taking the yield at 40% of the seeds), this would mean a consumption of 27,5000 tons of oil seeds per day or 10 million tons per annum (27,500—365 days) which is half as much more as the total crop of oil seeds of all varieties (edible and non-edible) grown in India, and twice as much as the present crop of edible oil seeds. Some of the edible oils like Cocoanut, Groundnut, Linseed, Rape and Mustard have also industrial uses, and if the growing needs of the existing and new industries for these oils are taken into account the crop of the edible oil seeds would have to be increased still further.

4. There is no likelihood of these targets being reached in the next five years, principally because it would mean a large extension, if not doubling, of the

acreage under oil seeds cultivation, which may not be feasible with the emphasis that is being placed at present in growing more cereals. It also does not seem immediately practicable to grow two blades of grass where one grows at present from the same acreage without proper use of fertilisers or cultivation of better strains, to produce higher yields both in all content and quantity. We, therefore, recommend what we consider to be possible of achievement within a period of five years, although we fully appreciate that to reach this target it would need the co-ordinated effort on the part of all concerned *viz.*, the Department of Agriculture, Industries and Forests of the Governments of various provinces and Indian States. Special efforts will have to be made to grow Mhowa, neem etc. on plantation scales; to collect all varieties of oil bearing seeds which grow in the forests of India and which are neglected at present and to develop and cultivate new varieties of seeds like Thung (Alourites fordii), African plan (Elacis guineensis), Babassu (Orbignya speciesa), Oiticica (Lieinia rigida) and Soya bean (Soja (Glycine) max) to meet the growing demands of Indian industries, and to exploit to the fullest possible extent the existing resources of the country. Mention may be made of only one oil seed, *viz.*, the cotton seed, which in the opinion of this Panel, is being wastefully utilised as a cattle food, when scientifically exploited it can yield valuable edible oil to meet the already deplorably low consumption of fat in the country and an excellent cattle food in the form of decorticated oil cake. We do not wish to indulge in oft-repeated platitudes, but we cannot emphasise and stress too strongly, that only when the existing resources of the country are fully exploited and developed in a systematic manner and on scientific and planned lines, would real wealth be created, and progress achieved in the attempt to develop the country industrially, and to raise the standard of life of its people.

5. In this report, we propose to confine ourselves to fixed oils and fats and essential oils. Mineral oils have not been considered as it is beyond the scope of this Panel. We shall also deal with only the principal and the most important oil seed crops and their oils and cakes. There are a number of other verieties of oil seeds, which grow in the country on a small scale, or are found in the forests of India, but about which no exact data are available. We have omitted any reference to them where we have felt that they are unimportant to either the economy or the industries of the country, but where we have noticed their significance, as in the case of Mhowa or Karanja seeds, we have dealt with them specifically. We may at this juncture also make a pertinent observation, that in planning for an important industry like the oil industry, we have been greatly handicapped by the lack of statistical data. We cannot recommend too strongly the importance and need of making a start with collection of statistical data on the oil crushing industry of India, on as wide and comprehensive a scale as possible. We feel that it would prove to be of untold benefit to the country to draw up a plan for collection of its industrial statistics, which would form a useful basis for the planning of the next stage of industrial development in the subsequent five year periods.

6. **Directive—The scope and extent of development, including the type of products recomended**;—We shall in the first instance consider the different aspects of the fatty or fixed oil industry as distinct from the essential oils, with reference to General Directive to Industrial Panels. Chemically speaking, fixed or fatty oils are a combination of naturally occuring glycerides of a number of fatty acids cover a wide range of products of vegetable and animal origin.

The principal oil seeds crops of India at present are:—

(*a*) Groundnut (Arachis hypogaoa).
(*b*) Rape and Mustard (Brassica rapa and Brassica Campostris, Nigra and Juncia).
(*c*) Linseed (Linum usitatissimum).
(*d*) Sesamum (Sesamum indicum).
(*e*) Cocoanut (Copra) (cocoas nucifors and Butyracca).
(*f*) Caster (Ricinus communis).
(*g*) Cotton Seed (Gossypium horbacoum and indicum).

Amongst the smaller and lesser known crops may be included Mhowa & Ellipo (Madhuca (bassin) Latifolia) and Longifolia), Neem (Molia azadirachta) Kararja or Pongamia glabra), Maroti (Hydnccarpous Wightiana), Chalmugra (Trakto genos kurzid), Dhupa (Vatoria, Indica), Poppy Papavor Somiforum), Nigar (Guizota abyssinia), Poonseed (Pinney) Calophyllum) Inephlim) Safflower or Kardi (Carathmus tinctorius).

A. GROUNDNUT OIL.

We understand that the present annual production of groundnut in shells, is 3·2 million tons, equivalent to 2·25 million tons of kernel. They are being utilised as under:—

	Shells. Tons.	Kernels. Tons.
Expert	436,000	305,000
Oil Extraction	2,000,000	1,400,000
Seeds	321,000	225,000
Edible use	453,000	320,000
Total ..	3,210,000	2,250,000

Of the 1,400,000 tons used for oil extraction about a fourth is estimated to be crushed by village ghannies and the balance by power driven ghannies, expellers and occasionally hydraulic presses. The yield of oil from 1·4 million tons of nuts would be approximately as under:—

	Oil. Tons.	Cake. Tons.
From 3,000,000 tons by Village Ghannies @ 35 % oil and 63 % cake	105,000	189,000
From 1,100,000 tons by Power mills @ 40 % oil and 58 % cake	440,000	638,000
1,400,000 tons. Total ..	545,000	827,000

The 545,000 tons of oil are utilised as follows:—

For Vegetable Ghee	140,000 Tons.
For Edible purposes	350,000 ,,
For Industrial uses, including Soaps, Lubricants etc.	55,000 ,,
Total ..	545,000 Tons.

As groundnut oil is a very important oil for edible purposes and industries, we are of the opinion that the production of groundnuts should be increased to 5.4 million

tons in shells, *i.e.*, 3·8 million tons in terms of kernel on the basis of the following allocations:—

	Shells. Tons.	Kernels. Tons.
Export (in the shape of oil and nuts)	1,430,000	1,000,000
For manufacture of Vegetable ghee	1,430,000	1,000,000
For manufacture of edible oil	1,430,000	1,000,000
For manufacture of oil for Soaps	178,750	125,000
For direct edible use	429,000	300,000
For seeds	500,500	350,000
Total ..	5,398,250	3,775,000
or say	5·4 million tons.	3·8 million tons.

Out of 1 million tons of kernels reserved for export, we recommend that no more than half the quantity be allowed to be exported as kernels and the other half be reserved for export in the shape of oil. It is not necessary for us to stress the obvious advantages that accrue to the country by encouraging the export of finished goods, in place of raw materials. In the case of vegetable oils, apart from the advantage of keeping the profits of crushing in the country, there is the added benefit of utilising the valuable bye-product of the crushing industry *viz.*, cake.

From 2,625,000 tons of kernels reserved for crushing in India (500,000 tons for export plus 1 million tons for Vegetable Ghee plus 1 million tons for edible oil plus 125,000 tons for soap) approximately 1,025,000 tons of oil and about 1,547,000 tons of cake will be produced as shown under:—

	Oil. Tons.	Cake. Tons.
From 500,000 tons kernel by village ghannies @ 35 % yield of oil and 63 % yield of cake	175,000	315,000
From 2,125,000 tons kernel by Oil Mills @ 40 % Oil and 58 % cake	850,000	1,232,000
2,625,000 Total ..	1,025,000	1,547,000.

The consumption of 1,025,000 tons of oil will be as follows:—

For Vegetable Ghee	400,000 Tons.
For Export	200,000 ,,
For Soaps and other Industrial uses	50,000 ,,
For Edible purposes	375,000 ,,
Total ..	1,025,000 Tons.

We understand the present acreage under groundnut cultivation is 7 millions, and for the 5 year target of 5·4 million tons in shells the acreage will have to be increased to 12·6 millions if the present methods of cultivation are continued, but if intensive farming with suitable manures and cultivation of high oil yielding strains are resorted to, the increase in the acreage may not be so much. We are also of the opinion that the speeds should utilised nearest to the centres of production, and cross transport should be avoided as far as possible without, of course, dislocating the industries already

established. Therefore, the increase in the area of cultivation, to reach the target, should be governed by the need for edible use, as also by the location of the vegetable ghee and soap factories and not exclusively for the export markets as hitherto has been the case.

Due to the increased production of oil, much larger quantities of cake—1,547,000 tons of cake as against the present production of 700,000 tons—would become available, and we recommend that this should, as far as possible, be utilised in India itself. We are strongly against the export of the cake, and recommend that an export duty may be levied according to circumstances, in order to discourage it. In the unlikely event of the export being permitted, due to special circumstances, we recommend that steps should be taken to see that the Indian Cake fetches a fair price in the International marketes.

The quality of cake for cattle feeding is strictly regulated in European countries to conform to certain standards which have been laid down by various international bodies, but there seems to be no uniformity in these standards. For instance, the standards laid down for European markets are not as stringent as these laid down in England. It has been invariably the experience of Indian exporters, that the English standard is deliberately used unfairly against the Indian cake, and is an indirect method of extracting concessions in price from the Indian exporter. The one factor due to which Indian exporters have often had to give a rebate, is the alleged presence of castor seed husk in groundnut cake. The English standard lays down the tolerance point to the fourth figure of the decimal, whereas in European countries the tolerance is at a higher figure. Whilst it is far from our intention to suggest that any deterioration in the quality of Indian cake should be permitted, the Panel is strongly of the opinion, that the Indian cake in the export markets, should not be subjected to the vagaries of standards which are not uniformly drawn up; and in order to protect the interests of the Indian industry and trade, an attempt should be made for obtaining a uniform standard at Governmental level.

The cake obtained in ghannies contains 5 % more of oil than that obtained in mills and to that extent, crushing by ghannies is wasteful, but in the present stage of Indian country, the elimination of the ghani may not be feasible. In any case, we advise that the crushing by ghani, be restricted as far as possible: and the increase by ghani-crushing for which we have provided, is the maximum likely to be utilised. We have provided for this increase, solely because we are anxious to see a wider and larger consumption of oil and cake by our people, and in the belief, that the mills may not be able to reach, with their products, the remotest areas, due to transport and other difficulties.

B. RAPE AND MUSTARD OIL

These seeds are generally classed and some times occur together. They are brown, yellow, red or black in colour. The oil from them is a popular edible oil in many parts of India, and blown rape oil is also used to a certain extent as a lubricant.

We understand that the total production of these seeds is, at present, about 1 million tons per annum about 5·6 million acres. The seeds are utilised as follows:

For domestic consumption	100,000	Tons.
For the production of 270,000 tons of oil @ 33 % yield	820,000	,,
For seeds	50,000	,,
For export	30,000	,,
Total ..	1,000,000	,,

Based on the following allocation, we recommend a five year target of 1·5 million tons of seeds requiring an acreage of 8·4 millions.

For domestic consumption	100,000 Tons.
For the production of 429,000 tons of oil @ 33 % ..	1,300,000 ,,
For seeds	75,000 ,,
For export	25,000 ,,
Total ..	1,500,000 ,,

It will be noticed that 159,000 tons more of oil would be produced, of which 153,000 tons would be available for edible purposes and 6,000 tons for industries (as blown rape oil). We believe there is a good prospect of developing the use of blown rape oil for lubrication purpose.

We understand that about half of the oil at present produced is by village ghannies and this proportion is likely to be maintained.

The cake from rape and mustard seeds, is used almost exclusively as cattle food. From 820,000 tons of seeds we estimate that about 510,000 tons of cake (a about 62% yield) must be produced at present, and this figure would be increased to about 806,000 tons. The increased quantity of cake should be retained in the country for internal consumption.

C. LINSEED OIL.

It is unnecessary to refer to the industrial importance of this oil, which is valued for the manufacture of paints and varnishes, boiled oil, printing inks, oil cloth, water-proof fabrics, soft soaps, tanning industry etc. It is also used as an edible oil in some parts of India. Its cake is valuable mainly as cattle food.

We understand that at present annually 400,000 tons of linseed are grown in India from 3·5 million acres, about 33% of the crop is exported, whilst the palace remain in the country for internal consumption. The Indian linseed is generally considered to be of good quality and to have a high oil content, and until the outbreak of the war used to a fetch premium in price over its chief competitor, *viz.* Argentine linseed. The allotment of the crop is as under :—

Export	136,000 Tons.
Domestic use	20,000 ,,
Seed	20,000 ,,
Oil extraction	224,000 ,,
Total ..	400,000 Tons.

Of the 224,000 tons of seeds crushed in these country for oil extraction, about a third is pressed by ghannies, and the rest, by power driven mills, to yield about 74,500 tons of oil and 142,500 tons of cake.

	Oil in tons.	Cake in tons.
From 150,000 tons of seeds by Oil Mills at 35% oil and 62% cake	52,500	93,000
From 74,000 tons by ghannies at 30% oil and 67% cake	22,000	49,000
Total .. 224,000	74,500	142,500

Out of 74,500 tons of linseed oil produced at present, about 30,000 tons are used for edible purpose and the balance of 44,500 tons for industrial uses mainly for paints and boiled oils.

We are of the opinion that the five year target for linseed, should be raised to 650,000 tons per annum, which will require 5·2 million acres of land. We believe the best scope for the expansion of the acreage is in the Central Provinces, the United Provinces, Bihar, Hyderabad and Central India States.

Out of 650,000 tons crop, we assume that an export of 200,000 tons will be maintained in view of the favourable price which Indian linseed commands abroad, and the balance of 450,000 tons would be available for domestic consumption. We estimate the allocation of the crop as under :—

Export	200,000 Tons.
Domestic use	30,000 ,,
Seed	33,000 ,,
Oil extraction	387,000 ,,
Total ..	650,000 Tons.

From 387,000 tons of seeds we estimate an yield of 129,000 tons of oil and 245,500 tons of cake as shown below :—

	Oil in tons.	Cake in tons.
From 267,000 tons of seeds by Oil Mills at 35% oil and 62% cake	93,000	165,500
From 120,000 tons of seeds by ghannies at 50% oil and 67% cake	36,000	80,000
Total .. 387,000	129,000	245,500

The allocation of 129,000 tons of oil is recommended as under :—

For edible purposes, prepared in ghannies ..	36,000 Tons.
For the paint industry	30,000 ,,
For boiled oil and other industrial uses ..	63,000 ,,
Total ..	129,000 Tons.

We recommend that the linseed cake, like the groundnut cake, should be retained in the country for cattle feeding and should not be allowed to be exported. Even in pre-war years the export was comparatively small, and during the war it has totally ceased. We recommend that during the post-war years the export should be banned, or an export duty be levied to make the export unattractive.

D. SESAMUM OIL.

This oil is used chiefly as an edible oil and to a certain extent for toilet purposes particularly as dressing for the hair etc.

We understand that the present annual production of the seeds is 416,000 tons in an area of 4·2 million acres, and it is almost entirely consumed in the country as will be seen below :—

Export	5,000 Tons.
Seeds	21,000 ,,
Domestic use	64,000 ,,
Oil extraction	326,000 ,,
Total ..	416,000 ,,

At one time and prior to 1913-14 the export of Sesamum seeds used to over 100,000 tons, but as the area under cultivation has not expanded, and as the internal consumption has continued to increase, the export has dwindled down to a negligible quantity.

From 326,000 tons of seeds, we estimate that about 117,000 tons of oil and 200,000 tons of cake are expressed ; we do not have figures of extraction by ghannies and power driven mills, but as the Sesamum oil is a very popular edible oil, we believe that about 75 % of the seeds is crushed in ghannies and the balance in mills.

As Sesamum oil is an excellent edible oil, and should be popularised we recommend that the five year target for the seeds be fixed at 600,000 tons per annum, requiring an area of 6 million acres. The allocation of the quantity should be :—

Seeds	30,000 Tons.
Domestic use	70,000 ,,
Oil extraction	500,000 ,,
Total ..	600,000 ,,

Out of the 500,000 tons of seeds for oil extraction, we are of the opinion that 200,000 tons should be crushed in Oil mills and the balance of 300,000 tons, in ghannies. The yield of oil and cake from this quantity will be as under :—

	Oil in tons.	Cake in tons.
From 200,000 tons of seeds by power driven mills, oil @ 40 % and cake @ 57 %	80,000	114,000
From 300,000 tons of seeds by ghannies @ 35 % oil and 62 % cake	105,000	186,000
Total .. 500,000 tons.	185,000	300,000

The 185,000 tons of oil produced would be utilised as below :—

For non-edible domestic and toilet purposes ..	45,000 Tons.
For edible purposes including 20,000 tons for Vegetable Ghee on the basis of 5 % of estimated vegetable ghee production of 400,000 tons	140,000 ,,
Total ..	185,000 Tons.

We understand that, for the easy detection of adulteration of ghee by Vanaspati, a compulsory addition of 5% of sesamum oil to Vanaspati mixture, has been recommended by the Vanaspati Manufacturers' Panel, and we have, therefore, provided 20,000 tons for the Vanaspati industry, in our allocation of oil.

The cake which forms 60% of the weight of seed crushed *i.e.*, about 300,000 tons we recommend, should be consumed entirely in the country, as it is a rich cattle food for both milch and draught cattle.

E. COCOANUT OIL (Copra).

Cocoanut oil is one of the most important oils for soaps, edible purposes and toilet use ; it is also used to a small extent as an illuminant and lubricant.

We understand that 220,000 tons of copra are produced annually, in an area of 1·5 million acres. This, not being sufficient, appreciable quantities of copra and cocoanut oil are both imported. From 1·5 million acres, the crop of cocoanuts is estimated at 3,300 million nuts of which about 1500 million are converted into copra,

and the rest are used for edible and religious purposes. Out of 220,000 tons of copra produced about 20% is retained for edible purposes, leaving thereby about 80% or 1,76,000 tons for milling. It may also be noted that prior to 1913-14 India was a large exporter of copra and cocoanut oil to foreign markets, but since 1919-20 this position has steadily altered, particularly with the increasing demand within the country for. cocoanut oil to feed its growing industries, mainly for soap, edible and toilet purposes. Since 1930, there is a steadily increasing import of copra and cocoanut oil, chiefly from Ceylon and Federated Malay States, as the Indian copra industry has not been able to cope with the demand, nor has the Indian cultivator been able to increase the acreage under cocoanut cultivation to meet this situation.

The present consumption of cocoanut oil is estimated to be 1,50,000 tons per annum, but this falls short of our requirements and the consumption would be much more if larger imports were possible. This quantity is being obtained to the extent of about 72% from 1,76,000 tons of local copra and the balance of 28% from imported copra and cocoanut oil. The imports have fluctuated within wide limits during recent years, due to the exigencies of year. The imports of copra have varied from 38,000 tons to 108,000 tons per annum, and of oil, from 5,000 tons to 60,000 tons per annum. During the last three years the Government restricted the imports to 65,000 tons of copra or its equivalent of oil per annum and that too only from Ceylon. Even this quantity was not imported on account of exigencies of war. The production of cocoanut oil in India may be taken at 1,38,000 tons (150,000 tons total consumption, minus 12,000 tons of imports) and this is estimated to have been produced as under:—

	Oil in tons.	Cake in tons.
From 187,000 tons of copra (140,000 tons Indian and 47,000 tons imported) by power mills @ 62% oil and 35% cake	117,000	65,000
From 36,000 tons of Indian Copra by ghannies @ 58 % oil and 59 % cake	21,000	14,000
Total .. 223,000 tons.	138,000	79,000

(*N.B.*—From 176,000 tons of Indian copra 108,000 tons of cocoanut oil are produced).

The 150,000 tons of oil are distributed amongst various consumers as under:—

Soap industry	35,000 tons.
Toilet and domestic uses	45,000 ,,
Edible purposes	66,000 ,,
Other uses	4,000 ,,
Total ..	150,000 ,,

We anticipate that the consumption of cocoanut oil will increase considerably during the next five years, and estimate it at 210,000 tons per annum on the following basis:—

Soap Industry	60,000 tons.
Toilet domestic uses	60,000 ,,
For edible purposes	80,000 ,,
Other uses	10,000 ,,
Total ..	210,000 ,,

There is no likelihood of any increase over the present production of copra in India during the next five years, as cocoanut is a 7 to 10 year crop. There will therefore be

a deficit of 102,000 tons of oil (210,000 tons estimated requirements, minus 108,000 tons from Indian copra) or in terms of copra about 170,000 tons. We desire to emphasise that this deficit of 102,000 tons of cocoanut oil, must be made up by imports, and suggest that the Government of India should make suitable arrangements for getting the bulk of this quantity as copra, from outside India. We have specifically mentioned the copra-equivalent of oil, because, by importing copra in preference to the oil, the resulting edible cake will be available for the milch cattle in the country, the present production of which is only 79,000 tons as shown above in the previous paragraph.

Before the war, India used to obtain its supplies of copra from Malaya and Singapore in addition to Ceylon ; during the war, supplies from sources other than Ceylon were no longer available, but now that the war is over arrangements should be made to import copra not only from Ceylon, but also from Java, Malaya and the Phillipine . We recommend that as there is already acute shortage of cocoanut oil in the country, Government should take urgent steps to sponsor and send a commercial delegation to the chief copra-producing countries to arrange procurement for India of adequate quantities of copra and if necessary oil to meet this shortage. We also wish to record our opinion that the imported copra should be permitted to be crushed only in seaport towns, by power mills in expellers and not by country ghannies, is a higher yield of oil can be obtained thereby.

Although it would not be of immediate benefit during the next five years, we recommend that attempts should be made to increase the production of copra in the existing area as also in new areas (*e.g.* Orissa and Bengal) to meet the increasing demands for the oil. We fix the ten-year target for copra at 300,000 tons per annum, which involves an increase of 50% over the present production. This can best be achieved by:

(*a*) carrying out cocoanut cultivation on a scientific basis to yield a larger number of nuts and

(*b*) by converting a larger number of nuts into copra than hitherto to meet the increased demand for oil.

As regards the former, we understand that in Ceylon, by a systematic and scientific cultivation, a higher yield of at least 50%, if not more,—is obtained from an acre. No doubt we also favour increasing the area under cultivation, but we strongly recommend pursuing the above two methods.

The Government of India, realising the need of improving the cultivation of cocoanuts in the country, have recently constituted the Indian Central Cocoanut Committee to look after the welfare of the industry, and we are sure, that with its help and guidance, and by systematic and scientific investigation, the Provincial and State Governments would be encouraged to increase their production by 50% within a period of 10 years. We lay special emphasis, on the necessity for assistance to cultivators in every form, both financial and technical, as otherwise, a long term crop like cocoanut, which takes 7 to 10 years to come to harvest, is not likely to be taken up by the cultivators.

Our attention has been drawn to the press note recently issued by the Indian Central Cocoanut Committee, asking the Government of India " to cancel the notification allowing free import of cocoanut oil and copra, and if it could not be cancelled, to set up a separate organisation, to arrange suitable distribution of the imports throughout India ". We have already laid stress on the insufficiency of Indian cocoanut oil resources as a result of which the soap and allied industries in India are suffering. We are surprised that the Central Cocoanut Committee should make this recommendation, which we consider very unusual, and we trust that the Government of India will not take any hasty decision on this recommendation before adequate proof are forthcoming from the Committee establishing that there is sufficient cocoanut oil available in the country, to meet its entire and increasing demand.

We are informed that adulteration of cocoanut oil with liquid paraffin, used to be practised to some extent before the war. As the war has ended, and imports of liquid paraffin might be resumed soon we recommend that Government should take steps to restrict its import strictly under control, and on satisfactory proof being furnished that it is being imported for strictly legitimate industrial uses.

In case there is difficulty in securing the supply of 102,000 tons of Cocoanut oil or its copra equivalent by import, we recommend that Government do explore the possibility of importing palm kernel oil which is identical in quality to, and an excellent substitute, for Cocoanut oil specially for the soap industry.

F. CASTOR OIL.

Apart from its use for medicinal purposes, castor oil is widely used as a lubricant. It is also used to some extent, for manufacture of soaps by the cold process, as also for soft soaps and Turkey-red oil. Dehydrated castor oil is useful for manufacture of paints and varnishes. A small quantity is also used for toilet purposes.

The figures of production of castor seed, as generally given, are, in our opinion, not accurate, as castor is often grown as a hedge crop, along with other crops, and seeds from this are not taken into account. Although the estimate in Government records of castor crop is given at about 116,000 tons per annum, our estimate of the annual production of castor seeds is 150,000 tons, including the hedge crops, and the corresponding area under cultivation is 1–5 million acres.

Before the war, about 50% of the crop of castor seeds was exported from India in in the form of seeds, but we are glad to observe that during the war this export has declined by more than half, and is now only about 20% of the total crop. Before the war, our export trade in Castor Oil has also been developed to the extent of 4,500 tons (equivalent to 12,000 tons of seeds) per annum, on an average, and this was a notable trend in the right direction.

In the beginning, Indian castor oil did not satisfy the specifications of the Hull and Hamburg markets, but eventually, Indian manufacturers were able to produce an oil of the requisite quality, with the result, that the export of the oil had been registering an upward trend. This was likely to increase still further, but the war seriously affected the export. How that the war is at an end, we recommend that Government should take all steps to facilitate the revival of this export trade. We also understand that Indian Railways have found by experience during the war, that by the use of castor oil as a lubricant, the wear and tear on the locomotives was far less than when mineral oils were used. We have no doubt that Government of India is fully alive to the importance of this subject, and that steps have already been taken by them, to instruct the Indian Railways to continue to use castor oil as a lubricant, instead of reverting to mineral oils. We nevertheless would like to draw the attention of Government to this fact, as it is likely, that pressure will be exercised by powerful foreign mineral oil interests on the Railways to go back to the use of mineral oil lubricants.

The crop of 150,000 tons of castor seeds is allocated as under :—

Export	23,000	Tons.
Seeds	7,000	,,
Oil extraction	120,000	,,
Total ..	150,000	,,

*It is understood from the Railway Board that this statement is not strictly correct while high grade castor oil (with low acid content) compares favourably with high grade mineral oil in regard to lubricating properties, the difficulty in india has been to obtain a high grade castor oil law in acid Content and price. The general use of castor oil during the war was due to the difficulty in obtaining Indigenous or imposted mineral oil.

The present production of castor oil is about 44,000 tons, and of cake, about 72,000 tons per annum, from 120,000 tons of seeds, and its utilisation is as follows :—

30,000 tons for lubrication.
4,000 tons for medicinal use.
10,000 for industrial uses such as manufacture of sulphonated oils, soaps, etc.

44,000 Tons.

On account of the possibility of increased uses of castor oil, we recommend a five-year target for castor seeds as under :—

For export	20,000	tons.
For seed	10,000	„
For oil extraction	200,000	„
Total ..	230,000	„

We are providing for an export of 20,000 tons only in the form of seeds, though we hope that by the end of five year period, the export in seeds will be replaced by an increasing export of oil.

From 200,000 tons of seeds reserved for oil extraction, we estimate a production of 74,000 tons of oil and 120,000 tons of cake per annum. We allocate the consumption of oil as follows :

For lubrication	44,000	tons.
For industrial use	5,000	„
For medicinal use	5,000	„
For export	10,000	„
Total ..	74,000	„

Castor cake is a highly nitrogenous fertiliser ; it has always found a ready market in the country, and i particularly popular with sugarcane growers and tea planters. The larger output of 120,000 tons of cake that we have estimated, should, therefore, find a ready demand in India and would be welcome by the farmers. We recommend that no castor cake should be exported.

G. COTTON SEED OIL.

Cotton seed oil is an excellent edible oil, which is totally neglected in India. This industry as developed to a very great extent in the United States of America where most of the cotton seeds are crushed for the extraction of the oil, which use for the manufacture of vegetable shortening and refined edible oils and to some extent also in the manufacture of soaps. In India, on the other hand, while nearly two million tons of seeds are available, the total quantity crushed is only a small fraction or about 15% of the total crop (equivalent to about 300,000 tons) and the quantity of oil produced is about 42,000 tons per annum, at an average yield of about 14%. The bulk of the seeds containing 18 to 22% oil, and a potential source of supply of an important industrial and edible oil, is lost to the country which is so deplorably short in the supply of edible facts and oils.

The reasons for this anomalous position are not far to seek. The crushing of cotton seeds presents a certain amount of difficulty, principally in the removal of the linters and husks, with the result that the oil is almost unknown to the village ghani owners. This had led to an easy method of disposal of cotton seeds, almost universally

throughout India, as a cattle food to the milch cattle, in its natural form, with the linters, kernel and all. This is the most wasteful method of disposal of an essentially rich oil seed, as the seed in its natural form, is too rich in oil content, to be fed to the cattle as such, and a large amount of oil, which would otherwise be useful to the people of the country, passes out unassimilated. In addition, in view of the demand in the country for the seeds as cattle feed its price is invariably and fictitiously high for the oil miller and has not attracted his attention, as he has found that his cost of the oil would be higher than the prices of other edible oils.

We understand that at present in addition to the two factories producing cotton seed oil from delinted and decorticated seeds, one in Navsari in Baroda State, and the other, in Hyderabad, Sind, there are over two dozen factories mainly in the Punjab crushing cotton seeds either as such or occasionally after delinting. We understand that no difficulty is being experienced by them, in the sale of their oil, cake or husk. We do not have any accurate information as to the manner in which the linters are disposed of, but we understand that some use is being made of them by way of waste spinnings.

Rao Saheb Athawale, a member of this Panel, has investigated the question of utilisation of cotton seed as a source of oil supply, and according to him the cotton seeds available in India can be classified under three categories; one having oil content of 17·5% and below, which is useless for the purpose of oil extraction, another having 17·5 to 20% and a third having 20 to 22·5% oil; the latter two varieties are suitable for oil crushing. His investigations also show that 75% of the varieties of cotton seeds produced in the country are suitable for oil pressing *i.e.* 1,900,000 tons of seeds and there should be no dearth of available raw material for the setting up of a cotton seed oil industry in the country.

Due to the presence of the linters and the husk, the yield of oil, by crushing cotton seeds in their natural state, would be 10 to 12% whereas if the seeds were delinted and dehusked, the yield could be improved to as much as 14 to 16%. In America, where the cotton seed oil industry is highly developed, the linter from the seed is a prized article, and is readily sought for the manufacture of cellulose, blotting paper, gun cotton, rayon, surgical lint, and even in the manufacture of textile goods like soft towels. In India, unfortunately, no industries have been developed yet, on a sufficiently large scale, to utilise the linters, but whilst the husk can find use as cattle fodder or fuel, the disposal of the linters would remain a problem for some time to come. We understand that on an average about 2% of linters can be obtained from cotton seeds; even if half the quantity of cotton seeds produced in India were to be utilised for the expression of oil, 6000 tons of linters would become available for industrial use. We appreciate that this difficulty is in the way of a wider adoption of cotton seeds for oil expression, but we do not think that this is unsurmountable, particularly when we are thinking in terms of a large scale industrialisation in the country, and in which the development of industries for the manufacture of cellulose rayon, surgical goods, gun cotton etc. is sure to be planned. We understand that the Rayon Panel has envissaged a production target of 60 to 70 tons of Rayon per day which would require more than 20,000 tons of cellulose material for which linters would be an ideal raw material, provided these are made available to the industry according to the specification and free from non-cellulosic impurities, such as husks, particles of kernel etc. The disposal of the linters should, therefore in a short while present no problem to the country. Since, however, delinting is a special process and delinting machines are designed to suit different varieties of cotton seeds, the Panel recommends that the various Provincial and State Governments do take steps to collect and forward representative samples of cotton seeds grown in their areas to the U. S. A. machinery manufacturers for experiment and desiging of suitable delinters of guaranteed performance. It may be possible for the Central Government to co-ordinate this work from a single organisation.

As regards the oil, it will find ready use in the vegetable ghee industry and when refined, as a cooking oil, whilst the cake can take the place of seeds as an excellent cattle

food. We are not unaware of the prejudices that would have to be contended with in weaning the cattle owner from the use of seeds, and substituting it by cake from decorticated seeds, but a systematic education, supported by practical demonstrations, and sustained propaganda by Government Agricultural and Animal Departments, should, in course of time yield beneficial results.

In view of the difficulties we have enumerated above, we hesitate to fix a target for the setting up of a cotton seed oil industry during the next five years, unless a widespread propaganda is undertaken by Government, in popularising the idea of the greater benefit that would accrue to the agriculturist as also to the cattle owner, by converting the seed into oil and cake, and untilising the seed in a more beneficial and less wasteful manner than at present. At the same time, we also feel that, as already over a dozen mills are operating on cotton seeds in India, their example might prove infectious, and encourage others to develop this industry. It is conceivable, that in the course of the next five years, the requirements of the seeds for crushing purposes might go up to as much as 750,000 tons per annum.

We recommend that Government should encourage, in every possible manner, the setting up of mills for the crushing of cotton seeds, and facilitate the imports of the special machinery and plant that would be required for not only the crushing industry but also for the refining of the oil. We also recommend that one of the three provinces, *viz.*, the Central Provinces, the Punjab and Bombay which produce large quantities of cotton seed, preferably the Central Provinces, should instal a demonstration plant for the expression of cotton seed oil, together with a suitable refiner, and thus encourage the development of this industry and the wider use of cotton seed oil in the country. A plant of 10 tons crushing capacity per day, to yield 5 tons of oil, together with a refinery, should not cost more than Rs. 7·5 lakhs and a successful demonstration by this plant would confer an inestimable boon on the country, in creating real wealth from a valuable raw material which is at present allowed to go waste,

H. MOHWA OIL.

This is a useful oil for the soap industry and is of the hard oil class like hydrogenated oils, palm oil, hardened fish oil and tallow which are required to the extent of 61,000 tons in the soap industry and are not easily available in India at present. Not being a cultivated crop, but collected from large trees which grow in the forests or on road sides in the United Provinces, Bihar, Central Provinces, Orissa, Hyderabad and some parts of Gujarat and South India, no statistics are available of the total quantity of seeds produced annually, but on a rough guess the total quantity available for oil extraction would be in the neighbourhood of 50,000 tons; from which about 18,000 tons of oil are obtained and used up by the soap industry. Looking to the requirements of the soap industry this production is negligible and there is even to-day a considerable shortage in the country.

Mohwa trees are valuable in many ways; they are excellent to grow along-side canals and main highways as they furnish good shade; the oil from the seeds is of great value for industrial purposes; and the flowers on fermentation yield alcohol. We recommend that efforts should be made to double the production of the seeds and oil, which can be done in two ways:

(*a*) by tapping all the existing trees in Bihar, Orissa and Central Provinces for seeds, which, we understand, is not being done at present, and

(*b*) by planting fresh trees.

We feel that the Provincial Governments should be made alive to the urgency of preserving the existing trees and utilising them to the maximum extent possible, and of growing additional trees to provide the soap and alcohol industries with their raw materials. We are not fixing any target for the next five years, as these trees take ten years for full growth, but we would urge upon all Provincial Governments the de ir-

ability of planting Mohwa trees as avenue trees and round about villages in preference to other trees. We understand that a full grown tree yield about 160 lbs. of seeds and 140 lbs. of flowers per annum.

About 30,000 tons of Mohwa cake are produced at present. Unfortunately Mohwa cake is neither edible, nor is it a good fertiliser due to its very low nitrogen content and the presence of saponin. It has some use as a wormicide, particularly for grass lawns, but this use is obviously limited ; at present in the absence of any other use it is used as a cheap fuel, but it would be advantageous to extract the oil from the cake by solvents, as the oil which is at present being lost as fuel could be used and made available to the soap industry.

I. MISCELLANEOUS VARIETIES :

We should like to refer to the importance of two oils, obtainable from the African Palm tree (Elaeis guineesis) for the soap industry and the edible oil industry. As already stated in para E on Cocoanut oil, palm kernel oil could make up the deficiency of cocoanut oil ; similarly palm oil would provide the quota for hard oils needed in the country for the soap industry. Considerable progress has been made in Malaya. Sumatra and other parts of West Africa to develop African palm plantations, and there is no reason why a development should not be possible in India also, many parts of which are suitable from climatic conditions and soil, for favourable growth of this variety of palm. We commend the attention of the Indian Council of Agricultural Research to the cultivation of this valuable oil-producing tree. We may mention by way of information that palm oil is obtained from the flesh of the fruit and the kernel oil from the kernel which is enclosed in the shell. The African palm tree is probably the only tree which yields two varieties of valuable fixed oils.

Another important oil is the Tung oil (Aloutites fordii) which requires special mention, as we understand that experiments are being made in the cultivation of tung trees in the hills of Assam and N.W.F.P. It is an excellent oil for paints and varnishes manufacture, particularly for water proof types. China has had so far the monoply of this oil, but large scale plantation developments are taking place at present in U. S. A. where it is believed self-sufficiency would be reached in the course of the next few years. For the development of the paint and varnish industry in India, it would, therefore, be advisable to develop tung trees on plantation scale at suitable localities.

It is true that attempts have been made to grow Soya bean (Soja) (Glycine max) in India, but as the cake is not getting its proper premium it has not been possible to produce the oil at an economic price and in consequence the cultivation of Soya bean has not been possible to produce the oil at an economic price and in consequence the cultivation of Soya bean has not made much headway. It may be worthwhile to examine this question further in detail, not necessarily from the point of its oil and cake, but on its merit as a nutritious material,particularly as a source of supply of vegetable protein in the form of milk, on which considerable work has been done at the Indian Institute of Science, Bangalore.

The seeds of many varieties of trees in the forests such as chaudonoogra, Dhupa, Hongay, Neem, Maroti etc., yield oils of industrial and medicinal value. The production of Hongay and Neem oils at present would be about 3000 tons each, and the total of all the miscellaneous oils would be about 10,000 tons. We recommend that although all these seeds may not warrant special efforts for their collection, such of them as are and could be collected, should be gathered in a more systematic and widespread manner, so as to obtain their oils on a larger scale. Those that could not be collected separately, should be gathered and expressed all together, to give a mixture of oils which generally goes by the name of "Modley oil" and could be used directly in the manufacture of soaps. Several of these seeds could be collected from the Indian forests, if a special effort is made. At present some of these seeds go under the nomen-

clature of "minor forest produce", but we are of the opinion that by a more systematic and widespread attempt, there would be a substantial increase in the revenue of the Forest Departments from this source.

J. FISH OIL AND TALLOW.

(*a*) *Fish Oil*; Madras, Bombay, and Travancore Governments have made some attempts to develop the fish oil industry. The industry is still in a nascent stage of development, but we understand it is contemplated to develop it on an extensive scale; thus an opportunity would present itself for an extension of both the fish oil and the liver oil industry in the country. The liver oil has considerable medicinal value and would go some way to meet the vitamin deficiency in the diet of our people. The fish oil, by itself, has many industrial uses, but, if hydrogenated, will provide a good edible oil and also a suitable raw material for industrial and household soaps.

(*b*) *Tallow*; From a recent survey by the food Department of the Government of India, it is reported that about 32,000 tons of tallow are produced from slaughtered animals and 6,500 tons from dead animals, making a total production of 38,500 tons per annum. We are, however, led to believe that this is an under-estimate, as the number of slaughter houses in India is presumably higher than 98 as reported and further the number of animals slaughtered must be more than 4·5 millions per annum. Also the slaughter houses in the Indian States have not been taken into consideration. The total production of tallow may, therefore, be taken as obviously more. In addition to the indigenous production, about 25,000 tons of mutton tallow were imported annually before the war from Australia and New Zealand.

The chief uses of tallow in India are for edible purposes, lubrication, for sizing in textile industry, tanning, to a small extent in the soap manufacture and recently also in the manufacture of stearic acid.

In India the tallow industry has not been adequately developed partly because of religious susceptibility and partly because the India sheep and cattle, which go to the slaughter houses, are deficient in fat content. The quality of Indian tallow also leaves much to be desired. Unlike India, in Australia, Argentine and other large meat producing countries, the meat industry is highly developed; cattle are specially fed on a scientific balanced diet, which yields a higher percentage of fat and meat, and the bye-product tallow industry is developed on modern lines. Until, therefore, steps are taken to improve the breed and quality of Indian sheep and cattle, we see very little hope of an improved tallow industry in India.

As it is reported that the world distribution of tallow is controlled by the Combined Food Board, which has restricted its use on account of the food fat shortage all the world over, we feel that India is not likely to receive any imported tallow in an substantial quantity for industrial purposes, for some years to come. In the circumstances, we recommend that a detailed survey be made of all the slaughter houses in India and particularly those which purvey to the armed forces in the country, with a view to develop and establish a refined tallow industry in India.

SUMMARY.

We deem it necessary and advisable to summarise the implications of the targets who have proposed in terms of acreage, seed, oil and cake production, in the following two tables:—

TABLE I.

Implication of targets (in thousands).

	Existing production	Acreage.	Proposed production	Acreage.	Increase in acreage.
	Tons.	Acres.	Tons.		Acres.
(*a*) Groundnut in shell ..	3,210	7,000	5,400	12,600	5,600
(*b*) Rape and Mustard ..	1,000	5,600	1,500	8,400	2,300
(*c*) Linseed	400	3,500	600	5,200	1,700
(*d*) Sesamum	416	4,200	600	6,000	1,800
(*e*) Cocoanut (Copra) ..	220	1,500	300	2,250	750
(*f*) Castor	150	1,500	230	2,000	500
Total ..	5,396	23,300	8,630	36,450	13,150

NOTE :—Production of 2 million tons of cotton seed has not been included in the above table, as the cotton seed oil industry in the country is in a nascent stage and we have not recommended an increase in the cotton area.

TABLE II.

(Implication of Targets) (1000 tons of oils and cake.)

	Present production.		Proposed production.	
	Oil.	Cake.	Oil.	Cake.
(*a*) Groundnut oil	545	827	1,025	1,547
(*b*) Rape and Mustard oil	270	510	429	806
(*c*) Linseed oil	74·5	142·5	129	245
(*d*) Sesamum	117	200	185	300
(*e*) Cocoanut oil	138	79	210	124
(*f*) Castor oil	44	72	74	120
(*g*) Cotton seed oil	42	99	105	248
(*h*) Mohwa oil	18	30	36	60
Total ..	1248·5	1959·5	2193	3450

6. 3 (1-A). The estimated requirements of capital goods together with such details of those requirements as may be available in India; and how much should be imported from abroad.

We estimate that there are at present 400,000 bullock-driven ghannies, crushing about 600,000 tons of seeds of all varieties per annum. In addition there are about 8,500 power driven rotary ghannies and 500 screw presses which are not registered under the Factories Act, and which between them crush about 500,000 tons of seeds or approximately a total of 1,100,000 tons of seeds are crushed per annum, by bullock-driven ghannies and small scale establishments.

We do not recommend any increase in the number of bullock-driven ghannies, as we consider that utilizing improved types of village ghannies which being developed in various provinces, it is possible to handle 800,000 tons of seeds per annum with the same bullock power. In the case of the small scale establishments of power-driven rotaries, we envisage an increase of about 50% in their number to enable them to handle about 800,000 tons of seeds per annum. Thus a total of 1,600,000 tons of seeds per annum would be crushed during the next five years in bullock ghannies and small scale units if our targets of increased production of seeds are reached. We may add that there would be no need for importing any of the equipments for the village ghannies industry.

As regards power-driven mills registered under Factories Act, we understand that there are about 700 such factories in the country, having approximately 3000 expellers, 100 hydraulic presses and 15,000 power driven ghannies, and they crush between them 2,400,000 tons of seeds per annum as under :—

In 3000 expellers	1,950,000	tons.
In 100 Hydraulic presses	150,000	,,
In 15,000 Rotaries including 8,000 working in Mustard Seed, which is included with expellers as the preliminary crushing is done in ghannies and final crushing in expellers	300,000	,,
Total ..	2,400,000	,,

We estimate the increase in crushing by mills to about 4,500,000 tons of seeds per annum at the end of the five-year-target, requiring a minimum of 1,800 new expellers and about an equal number for replacements of the existing ones that have become obsolete and/or have been worn out, making a total of 3600 expellers. On account of restrictions and other difficulties, as well as due to worn out condition, the existing expellers are working at only about 40% of their capacity.

In our estimate, we have, therefore, provided for a 60% increase in the number of expellers in order to utilise them at a higher capacity, which, according to us will work out to about 65%. It would be also necessary to import about 100 new hydraulic presses for increasing the crushing capacity in the country as also for replacement. As regards rotaries, there would be a corresponding increase of about 3000 new rotaries, there would be a corresponding increase of about 3000 new rotaries, which, however, would be made in the country.

TABLE III.

Allotment of the crushing industry would be as under :—

In 4,800 expellers	3,922,000	tons.
In 150 Hydraulic presses	225,000	,,
In 18,000 Rotaries	425,000	,,
Total ..	4,572,000	,,

The following table will show the present position of seeds crushed in ghanniea and mills and the targets that we have recommended for crushing ;—

TABLE IV.

	Quantities crushed at present.		Quantities expected to be crushed.	
	Ghannies.	Mills.	Ghannies.	Mills.
	Tons.	Tons.	Tons.	Tons.
(*a*) Groundnut	300,000	1,100,000	500,000	2,125,000
(*b*) Rape and Mustard	410,000	410,000	650,000	650,000
(*c*) Linseed	74,000	150,000	120,000	267,000
(*d*) Sesamum	244,000	82,000	300,000	200,000
(*e*) Copra	36,000	187,000	36,000	310,000
(*f*) Castor	20,000	100,000	20,000	180,000
(*g*) Cotton seed	..	300,000	..	750,000
(*h*) Mhowa	10,000	40,000	10,000	90,000
Total ..	1,094,000	2,369,000	1,636,000	4,572,000

The hydraulic presses would have to be imported entirly as no presses are being made at present in India, and we do not think that for the new presses that have to be imported it would be worthwhile for any party in India to undertake their manufacture.

In the case of the expellers the position is a little diffent, as the manufacture of expellers has commenced in India and to foster the Indian industry it would be necessary to restrict the import of 2,200 standard type of expellers or its equivalent in 1700 standard type and 150 modern high capacity twin motor expeller during the next five years, allowing the Indian expeller industry to meet the balance of the requirement of 1400 or so. We recommend the following programme of import which has been drawn after taking into consideration the likely development of the Indian expeller industry :—

	Number of Expellers.	
	Import.	Indian manufacture.
1st year	650	200
2nd year	650	275
3rd year	400	275
4th year	300	300
5th year	200	350
Total ..	2,200	1,400

We understand that at present about a dozen workshops are manufacturing expellers and their spares in India. The factories are located in Bombay, Punjab, Bihar, Central Provinces and Bengal. A few of these expellers are of a tolerable quality, but the majority of them are unsatisfactoy. The Indian manufacturers are not in a position to produce expellers in sufficient number to meet the demand, and they suffer from a further handicap in not having suitable steel, ball and thrust bearings and other essential parts of a durable quality. The Indian expellers are being made to an antiquated design and it is but natural for the Indian oil crushing industry being not satisfied with the performance of these expellers as compared with the more up-to-date design of the foreign expellers. The Indian expeller suffers from the following four defects:

1. Lower production capacity.
2. Lower yield of oil.
3. Higher power consumption.
4. Higher wear and tear resulting in frequent replacement of parts.

In addition to expellers and hydraulic presses, the industry will have to import boilers for the larger mills, distintegrators, tempering kettles, chilled iron crushing rolls, accumulators, and hydraulic pumps. Other equipment such as filter-presses, conveyors, elevators, tanks, centrifugal pump etc. which are also needed in an oil mill would be available in the country.

In order to utilise the fact resources of the country to the fullest possible extent, it would be desirable to introduce solvent extraction plants, as we have recommended already in the case of Mhowa cake, for recovering the oils from non-edible as well as other manurial cakes and also from seeds of low oil content, and these which do not lend themselves to easy and economic expression by mechanical means. There is at present only one solvent extraction plant in the country at Kalyan, Bombay Presidency, but this plant is of an oil type, and we are of the opinion that if half a dozen solvent extraction plants of modern design for treating 20 tons per day of material, (seed or cake) be installed in the country it will prove beneficial.

We estimate the cost of importing expellers, hydraulic presses and their ancillary equipment, on the following basis at 5·90 crores.

1. (*a*) 1700 Standard type expellers inclusive of heating kettle and power plant	Rs. 2·55 crores.
2. (*b*) 150 Modern High capacity twin motor expellers ..	Rs. 1·30 „
2. (*c*) 100 Hydraulic presses including accumlators and hydraulic pumps in units of four	Rs. 0·30 „
3. Ancillary equipment :—	
(*a*) 60 sets of rolls	Rs. 0·12 „
(*b*) 200 Disintegrators	Rs. 0·06 „
(*c*) 100 Biolers including power plant	Rs. 0·30 „
(*d*) Miscellaneous equipment such as Shakers, Manetic separators, Delinters, decorticators, conveying machines etc. ..	Rs. 0·50 „
4. Solvent Extraction plants	Rs. 0·20 „
Total	Rs. 5·33 „
Add 10% for contingency	Rs. ·53 „
Total	Rs. 5·86 „
or say ..	Rs. 5·90 „

7 3(2) **Whether the industry should be under Government ownership either on grounds of national interest, or because private capital is unlikely to take it up, and if so, whether it should be wholly or partly managed by Government.**

We are of the opinion that the oil industry should be completely under private ownership; we do not anticipate any difficulty in private capital taking up the development of the Vegetable oil industry, which is an ancient and well-established industry in the country.

8 3(3) **In the case of industries to be developed other than under State ownership, the capital required for such development whether the whole of it is likely to be available by public investment, and if not the extent to which Government assistance may be required:**

In our opinion the whole of the capital required would be available by public investment except in the case of the cotton seed crushing industry for which we have recommended the setting up of a demonstration plant in the Central Provinces by Government at their expense.

9 (3)(4) **The extent to which technical advice from abroad may be necessary:**

We do not see any necessity of obtaining technical advice from abroad except in the designing of suitable equipment for special processes such as cotton seed delinting, decortication of some variety of seeds and refining equipment and technique, for which technical guidance from abroad, say U. S. A., Germany and U. K. would be necessary, for a limited period of five years. Otherwise we consider the available Indian talent good enough for the furtherance of the industry. We would recommend, however, that a few selected technical personnel might be sent abroad to both Europe and America to study the extent and development in design and operation of oil expressing and extraction plants, as also of oil refining.

10 (3)(4-A) **The advisability and future requirements of technical Personnel, so as to obtain a clearer indication of the present shortcomings and future needs.**

Same as para 9(4) above.

11 (3)(5) **The manner and the degree of co-operation with foreign firms considered necessary and desirable, both as regards capital and management.**

In the operation of oil expression and extraction we do not consider it necessary to obtain the co-operation of foreign firms either as regards capital or management. In fact we are of the firm conviction that no foreign capital or management should be allowed or encouraged in the extension and development of the oil crushing industry. At present there are a few foreign (India), Ltd. firms operating in the oil crushing industry and we recommend that Government do take early steps to liquidate these concerns and convert their capital and management to Indian currency and Indian control respectively.

It is only in the manufacture of plant and equipment, particularly expellers, we recommend that as considerable advance has been made in the design of expellers in the U. S. A. and Germany, it would be advantageous to Indian expeller manufacturers to obtain the co-operation of foreign manufacturing firms either by way of acquisition of patent rights under license and royalty basis or of technical collaboration and if necessary financial participation. In the case of financial partnership, it is our considered view that the predominant and ultimate control should be in Indian hands.

As oils are required for edible as well as industrial use in all parts of India, the oil crushing industry should be naturally located and spread throughout the country, and with greater concentration in oil seed producing areas. We would like to see the industry to be spread all over India, in order to minimise the transport of oil seeds and retain the oil cake in their respective areas for local consumption. In larger towns and sea-ports, however, we are in favour of larger units being established to deal with inter provincial and export trade in oils and allied products, as also to crush imported oil bearing materials. We are also of the opinion that a group of 3 to 4 expellers having a capacity of 5 tons oil per day of 24 hours constitute a minimum economic unit and in the case of hydraulic presses the economic unit should not be less than four presses producing 10 tons of oil per day of 24 hours.

We also favour the establishment of at least two solvent extraction plants of a minimum capacity of 10 tons of oil per day to be located one each in Central Provinces and U. P., and if later necessity is felt for additional plants, they may also be started in other suitable areas.

13 (3)(7). **The nature of the assistance required from Government in the form of protective duties, bounties, research grant, expert advice etc.**

The Panel is of the opinion that the existing tariff duties on the import of vegetable oils and allied products should continue on all oils which are at present manufactured in the country. In the interests of the finished goods manufacturers we feel that raw materials should be allowed to be imported into the country, if not entirely free of duty, atleast at a nominal rate of duty.

Oils like Palm, Palm Kernel, Tung, Babassu, Oiticica and similar oils, which can be imported, can be included in this category. We should, however, make it clear that this should not apply to copra and cocoanut oil, which is an important industry in India and needs protection at the present moment. Our attention has recently been drawn to the fixing of floor and ceiling prices for copra and cocoanut oil by the Government of India. We consider this a step in the right direction as it protects the interests of the cocoanut growers in the country and at the same time allows consuming industries, like soap and others, to obtain their raw materials at a reasonable price.

The Panel is also of the opinion that the existing resources of Mohwa plantations should be extended by any systematic, aided and co-ordinated policy between the Central, Provincial and State Governments. Similarly the propagation of the Tung trees should be undertaken with a view to provide the valuable Tung oil to meet the requirements of the painting industry of the country. Further, efforts should be made to introduce the Palm plantation, specially on account of the fact that both palm and Palm kernel oil are important ingredients of the soap industry. Other important varieties which may be introduced in the country are Babassu and Oiticica oils, both natives of Brazil, from where seeds could be obtained. It is to be remembered that both Babassu and Oiticica oils perfect substitutes for Cocoanut oil. In this connection, it will be relevent to mention that countries like the United States of America, Soviet Russia, Kenya, Uganda and Egypt have introduced new varieties of plants into their countries in order to enable them to be self-sufficient, thus adding wealth to their resources. India could with advantage follow the same practice, and we feel that our recommendation should be taken up as a national policy for the benefit of the country and receive high priority at the hands of the different Governments concerned.

In order to achieve the objective recommended by the Panel, necessary research grants and other aids from Government should be forthcoming readily and generously. In this connection the existing Committees or Organisations like the Indian Council of Agricultural Research, the Central Cocoanut Committee and other similar bodies, which have to their credit a considerable amount of spade work, should be harnessed for carrying on their work further.

14. (3)(7a). **The relative incidence of the import duty on the finished goods in comparison with the duty on the raw materials from which they can be manufactured.**

This question has already been dealt with by us in the preceding section where we have stated that the existing tariff duties on finished products like soaps, toilet articles and hydrogenated oils should continue and that duty on such raw materials as are not produced in the country should be allowed to be imported at a nominal rate of duty.

15. (3-8). **If the industry is to be under private ownership and management, what controls, if any, should be exercised by Government.**

In order to improve the oil industry and make it more helpful for the allied industries, it is desirable to have definite standards of purity and clarity enforced in the manufacture of oils on an All-India basis. All such standards should be comparable and with the International Standards. The enforcement of standards would avoid any increase in tendency of adulteration in oils.

16. (3-9). **What should be the organisation of the different units of the industry** e.g. **should there be an industrial association? Would a cartel be desirable?**

The oil industry at the present moment is not properly organised in spite of the fact that it is one of the most important and widely spread industries of India. No All-India association exists at present, although some provincial associations have been established. It is desirable to co-ordinate the activities of all these associations in order to form an All-India Association to deal with problems of vital importance to the industry. The recent proposal of Government to set up a Central Oil Seeds Committee is to be welcomed, as it will focus the attention of all to the importance of the oil seeds and vegetable oil industry in the country. As we have stated in the soap report, we are opposed to any cartel being formed of the oil seeds or oil industry.

17. (3-10). **The stages by which the industry should be developed:**

We consider that the industry should be developed in accordance with our recommendations in the previous paragraphs for various oils. This development should take place simultaneously all over India and would be completed within 5 years.

In order to reach the targets of increased production of oils, we have recommended an increase in the acreage of cultivation. As the majority of oils, for which we have recommended increased production, are of edible nature and they form a valuable fatty material, we consider that priority be given for the expansion of this industry in order to meet the deficiency that is being felt at present in India in food and fat resources. We, of course, also stress that an increase in the oil seed crop can be achieved by means other than merely increase of acreage namely, the supply of improved quality of strains, better manurial and irrigation facilities, intensive cultivation, continuous research and prevention and eradication of pests and diseases.

18. 1 (3-11). **Should the industry cater for the export market. ?**

India in the past was one of the most important exporting countries for oil seeds and shared the biggest portion in the seed oil trade of the world. As India has to import a large amount of capital goods for the rapid industrialisation of the country, we realise the necessity of maintaining an adequate export trade but we strongly recommend that the medium of export trade should be developed from oil seeds to oils to an increasing extent. We have already in a previous paragraph recommended the levy of an export duty on oil seeds in order to encourage the export of oil in preference to seeds.

19. 3(12). **Should the industry be developed, as in Japan, on the cottage industry basis and, if so, to what extent. ?**

In Japan, as far as we are aware, the oil industry is not developed on a cottage industry basis. In India, however, the development of the industry is on three different lines :—

(*a*) Cottage scale,
(*b*) Small scale,
and (*c*) Large scale.

The cottage scale industry meets the needs of the villages and is run by means of bullock ghannies and manually driven appliances. It is reported that in the 700,000 villages of India there are about 370,000 bullock driven ghannies, which works out to one ghanni for every two villages. From an economic point of view those appliances should be considerably improved as there is at present an enormous retention of oil in the residual cake and which could be considerably reduced by improved methods of working. We are aware that it is not practicable to do away with the village ghannies altogether and replace them by the more efficient oil expellers or hydraulic presses. Also in view of the large distances it would not be feasible to transport seeds to large scale crushing centres and get back the finished products of oil and cake for consumption in the villages. We however, do not recommend that the number of bullock ghannies in the villages should be increased, as our bullock power is not sufficient but if the ghannies are improved and made power driven they will be able to crush larger quantities of seeds and more efficiently.

II. Essential Oils.—Essential oils, though distinct from vegetable for fixed fatty oils, are derived from vegetable realm. They are volatile and are extracted or expressed from roots, stems, barks, leaves, flowers, seeds, and peels and have an aromatic odour. Essential oils have a wide application and a few of their important uses are in the manufacture of soaps, perfumery, cosmatics, pharmaceutical preparations, confectionary, aerated waters, disinfectants etc.

2. In India essential oils have been known from times immemorial and used in the manufacture of perfumes and other toilet articles. Being fortunate in having a variety of climatic conditions and soils, India has a large variety of aromatic plants suitable for the extraction of oils. Indian essential oils and attars have a worldwide reputation. Unfortunately, the manufacture of essential oils and perfumes is being carried on by old fashioned methods, and in the absence of scientific technique and the inability of the cottage manufacturers, who largely carry on this trade, to adopt themselves to scientific methods, the Indian industry, except in rare instances, is in a deplorable state and needs considerable overhaul and regeneration.

3. No statistics are available to show the value of essential oils produced in India but it was reckoned that before the war, the trade in essential oils and aromatic raw materials exceeded a crore of rupees per annum. To-day with the rise in cost of commodities the value of this trade must be two-and-a-half to three time more. It is regrettable to observe that with a few exceptions the importance of essential oils to the economy of the country has not been recognised by the Industries, Agricultural and Forest Departments of the Governments of the various Provinces and Indian States, nor by the industrialists of the country. Lack of encouragement from Indian consumers of essential oils, like soap and perfume manufacturers, is reported to be one of the reasons for the non-development of the Indian essential oil industry, but during the war this charge can no longer be levelled against the Indian consumers as they were compelled to use the Indian oils in the absence of any other imports. The lack of interest is probably due to the ignorance of the Government Departments and the Indian Industrialist to the possibilities of developing this specialised and valuable industry, which, if established on scientific and modern lines, would help to find use for

a number of aromatic materials at present allowed to go waste or exported out of the country for the recovery of their essential oils. The example of the Government Sandalwood Oil Factory at Mysore might be cited as an industry which has been developed on a sound footing, and similarly if production of other essential oils is taken up and established on proper scientific basis, worldwide markets can be created for the Indian oils. Before the war, the total production of essential oils in the world amounted to about 10 crores of rupees, and there are possibilities of developing this important industry in India on a considerable scale with proper planning. The cultivation of a variety of aromatic plants in India does not appear to present any serious difficulty. With the growing demand within the country for soaps, toilet articles, pharmaceutical and other industries it does not require much imagination to visualise that within 10 to 15 years it is possible to make India self-sufficient in its requirements of essential oils and perfumery materials and develop an export trade.

4. The manufacture of essential oils is carried out by four well known methods:

(*a*) Water or Steam distillation,
(*b*) Expression,
(*c*) Enflourage and
(*d*) Solvent extraction.

In the water distillation method, which is commonly used, the aromatic material is soaked in water and heated under an open fire when the oil is distilled off along with steam and collected after separation of water. This method is crude and is being replaced in Europe and America by improved stills in which distillation is carried out by steam, which is quicker in operation and gives generally a better yield though the quality of the oil is likely to suffer in its aroma if proper care is not taken. The other methods are also practised for specialised purposes; for instance the oil from the pools of Citrus fruits like Orange, Lemon etc. is recovered by the expression method, in which the pools are pressed over sponges from which the absorbed oils are recovered by pressure. Similarly, in France, delicate essential oils from flowers of Jasmine, Tuberose etc. are recovered by the enflourage method in which the petals of the flowers are soaked and spread over trays of pure fat and when the fat is saturated with the essental oil it is then extracted with alcohol. The solvent extraction method is also practised abroad in special cases.

5. In India the production of essential oils is carried out generally by the water distillation method except in rare cases where steam distillation method is employed as in Sandalwood Oil and Turpentine factories. The production of pure floral oils is very limited in India and generally the floral perfumes are obtained as attars, the manufacture of which consists of heating the flowers, with water under an open fire in a copper vessel which is connected to a pot containing sandalwood oil in which the aromatic vapours are allowed to condense.

6. The important essential oils produced in India at present are:

(1) Cinnamon Leaf Oil.
(2) Eucalyptus Oil.
(3) Khus Oil.
(4) Lemon Grass Oil.
(5) Linaloe Oil.
(6) Palmarosa Oil.
(7) Sandalwood Oil.
(8) Turpentine Oil.

Small quantities of other oils like Ajwan, Ginger Grass, Rose, Lime, Goranium,

Agam, etc. are also produced. The total production of important essential oils in India is about 2,760 tons made up as follows :—

	Tons.
Cinnamon Leaf Oil	33
Sandalwood Oil	150
Lemon Grass Oil	500
Palmarosa Oil	50
Eucalyptus Oil	50
Khus Oil..	5
Linaloe Oil	3
Turpentine Oil	2000
Total ..	2791

7. Directive 3(1). The Scope and extent of development including the type of products recommended

(*a*) *Sandalwood Oil* : This oil is chiefly manufactured at the Government Factory in Mysore and also on a smaller scale at Kuppam and Mettur in the Madras Presidency, in the City of Bombay and at Kanauj in U.P. The production is estimated at present at 150 tons per annum, but as this quantity is not adequate to meet the growing needs of the country, we recommend that the Governments of Mysore, Madras and Coorg be requested to explore the possibilities of making available a larger quantity of sandalwood for distillation without detriment to continuous supplies. The Indian Sandalwood oil already enjoys an enviable reputation in world markets and India even exports sandalwood to America for the extraction of oil there due to the entry of the wood free of duty. At present we believe the Indian manufacturers of soap and other toilet articles are finding it difficult to obtain their supplies of sandalwood oil and we recommend that the export of oil be regulated in consultation with the manufacturers of oil and the principal consumers in order that the Indian consumers are not starved. We would also add that if Indian Sandalwood Factories are unable to obtain larger supplies of wood for increasing their production, we would recommend that the export of wood might be discouraged.

(*b*) *Lemon Grass Oil* : Lemon Grass Grows largely in Cochin and Travancore States and the production of Lemon Grass Oil is estimated at about 500 tons per annum. The bulk of the oil is exported, but in view of the development of the soap industry that we have proposed in India and for which we have estimated a demand of 860 tons of essential oils (400 tons for toilet and 460 tons for laundry soap), we believe a larger quantity of Lemon Grass Oil would be absorbed in the country. Lemon Grass oil is at present produced entirely on a cottage industry basis and is carried out in old fashioned stills. As the grass grows scattered all over the place it is not possible to set up large factories for the extraction of the oil but we recommend that steps be taken to help the distillers with better type of stills in order to enable them to extract a larger percentage. We recommend that the production of Lemon Grass Oil be increased from 500 tons to 700 tons per annum as we believe that a good deal of this increase in quantity can be obtained by improving the method of distillation without the necessity of any increase in the area under cultivation of the grass. The increased production will take care of both the internal demand and the export market which under the circumstances should be continued.

(*c*) *Palmarosa Oil* : This is an excellent oil for the soap industry ; its annual production at present is estimated at about 50 tons. This oil used to be exported formerly, but during the war it has been finding increased use in the soap industry and has been in fact now found inadequate to meet the requirements of this industry. Rosha Grass from which Palmarosa oil is extracted, can be easily cultivated and within one year of its cultivation the grass is available for extraction of oil. We recommend

that the production of Palma Rosa Oil be increased to 100 tons per annum and this could easily be obtained by exploiting all the areas where Rosha grass is grown and utilising the grass for the distillation of oil by a more scientific method. At present the grass grows wildly in the forests and is not accessible for exploitation, but if a systematic attempt is made to collect the grass and distil the oil by modern methods it will lead to an increase in production without increasing the area of its cultivation. We also recommend that Rosha Grass be grown on a plantation basis as is being done at present in Sheikhpura.

(*d*) *Eucalyptus Oil*: This valuable oil is produced at present in the Nilgiris; the distillation of the oil is carried out by old fashioned methods. As the eucalyptus trees are located in a centralised area, we believe there is an opportunity for the establishment of a proper factory for the manufacture of Eucalyptus oil which will increase its production, which is estimated at present to be 50 tons per annum and which has declined from 90 to 50 tons during the last few years due to intensive exploitation of Eucalyptus trees for timber purpose. We recommend that the production of Eucalyptus Oil be restored to 90 tons per annum. We understand that the Eucalyptus trees in the Nilgiris are steadily disappearing as they are being used for timber purpose and firewood, and we recommend that the Government of Madras be requested to put a stop to this practice and to see that new trees are continually replanted in order to encourage the development of its essential oil. We also understand that some parts of U. P., Bihar and certain parts of Orissa are suitable for the cultivation of Eucalyptus trees, and we recommend that the attention of the respective Governments be drawn to the desirability of encouraging its plantation with a view to develop the essential oil industry.

(*e*) *Khus Oil*: Khus Oil is one of the most important of essential oils and is distilled from the roots of Khusgrass which grows abundantly in widely different parts of India viz. in U. P., Bharatpur, Punjab, Central Provinces and Malabar. The distillation of the roots is carried out by primitive methods and the annual production of oil rarely goes above 4 to 5 tons. Khus Oil, along with patchouli and geraniol forms one of the three most important essential oils in the blending of good perfumes, and the oil is of great importance to the perfumery industry. We have no hesitation in recommending that the production of Khus Oil be increased from its present insignificant quantity to at least 15 tons per annum. We understand that a systematic investigation of the Khus roots of India has been made recently under the auspices of the Essential Oil Advisory Committee of the Council of Scientific & Industrial Research and if a systematic cultivation of Khus grass is undertaken it will be possible to increase substantially the yield of the grass and oil by modern methods of cultivation and scientific methods of distillation.

(*f*) *Linaloe Oil*: This oil is produced on a small scale in one Estate near Bangalore. The distillation of the oil is carried out with modern still but the production of the oil is about 3 tons per annum. As this is a fine oil and can be used in the manufacture of soap perfumes, we believe that it has possibilities and the extension of its use should be encouraged and Linaloe plantations should be developed on a larger scale to yield a larger quantity of oil. The plantation, however, takes a few years to develop and it may not be possible to increase the yield of oil substantially in the first target of 5 years.

(*g*) *Turpentine Oil*: Turpentine oil is obtained by steam distillation from the oleo resins from pine trees. In India, the distillation at present is done from oleo resins of Pinus longifolia. There are at present three factories in India producing turpentine oil, one in the Punjab, one in U. P., and the third in Kashmir. The production of Turpentine Oil is estimated at over 2000 tons per annum and the oil is produced in two or three grades. Turpentine oil as such has a limited use in the perfumery industry, but it is an important oil of commerce in paint and varnish industries. It is also a starting material for the manufacture of camphor and Terpineol. The latter is a valuable perfumery ingredient, but unfortunately the Indian turpentine oil is not

rich in alpha pinene and the manufacture of Turpineol or camphor is not, therefore, an economic proposition. In India, however, Pine trees rich in alpha Pinene are available in the forests of N. W. F. P., Punjab, U. P., Assam and Kashmir but lack of suitable roads and inaccessibility of approach have prevented these trees, particularly Pinus excelsa from being tapped. It would be relevant to observe that both resin and turpentine are obtained from the distillation of oleo resin. In our soap report we have recommended a target consumption of 27,500 to 37,5000 tons of resin in soap manufacture. From the 2,000 tons of turpentine produced at present in the country, the estimated production of resin may be taken at about 7000 tons. Therefore in order to provide the target figure of resin from Indian sources, the distillation of oleo resin should be expanded to four to five times the present size. If this were done there would be the obvious advantage in the increased production of natural turpentine to meet the requirement of the paint industry. A further desirable result will be reduction in the imports of the artificial on mineral turpentine of which about 4 million gallons (16,000 tons) have been recommended for being imported by the Paints and Varnish Panel.

(*h*) The other valuable oils that are produced in India are those of Goranium, Cinnamon leaf, Rose, Ginger Grass etc. The production of these oils is on a very small scale, but they could be easily expanded if a systematic attempt is made for their cultivation and distillation. There are also a large number of raw materials available in the country which at present are wasted, for example in the Central Provinces and other areas where the cultivation of orange is carried out, it is possible to develop a large scale citrus oil industry. Two important oils which require to be well developed are the Goranium oil, which is at present produced on a small scale at Yercaud and the Cinnamon leaf oil for which raw material is available in India. There are numerous other varieties of essential oils which also can be developed in the country, as for instance Citronella and Patchouli which are important essential oils of commerce; also ocimum. Some time ago Government of India had a survey made into the possibilities of growing clove, the cultivation of which will meet the requirements of the country for domestic and industrial purposes. There are also several aromatic seeds, like ajwan, aniseed, juniper, cardamom etc. which are grown in the country but are exported for the recovery of essential oils.

8. (3)(1-A). **The estimated requirements of capital goods together with such details of those requirements as may be available in India and how much should be imported from abroad.**

In the absence of any regular industry we are unable to estimate the requirements of capital goods, but we believe that the distillation plants can be manufactured in India, but specialised equipment like glass lined vessels would have to be imported.

9. (3)(2). **Whether the industry should be under Government ownership either on grounds of national interest or because private capital is unlikely to take it up, and if so whether it should be wholly or partly managed by Government.**

We are of the opinion that in order to encourage the development of the essential Oil industry it would be advisable for Government to take up the manufacture of essential oils on systematic and sound lines, by putting up demonstration plants in different localities. We are generally averse to Government ownership, but in this particular instance in view of the poor development in this industry we believe that as in the case of the Government Sandalwood oil factory at Mysore, the various Provincial Governments should establish in the initial stage essential oil factories according to the availability of aromatic raw materials. Such a step might bring forward industrialists to develop this industry on a large scale in course of time. In order to develop the essential oil industry, we recommend that a special wholetime directorate should be created by Government of India with facilities for large scale field experiments and

laboratory research on a pilot plant scale. This directorate should also give advice both to the cultivators and the manufacturers for the development of this important industry in the country.

10. (3)(3). **In the case of industries to do developed other than under State ownership, the capital required for such development, whether the whole of it is likely to be available by public investment and if not, the extent to which Government assistance may be required:**

We have no objection to the setting up of plants by public investment if the requisite capital is forthcoming or partly with Government finance and partly with private capital, although we have recommended the development of the industry in the initial stages under Government ownership.

11. (3)(4). **The extent to which technical advice from abroad would be necessary:**

We do not think that any technical advice from abroad is necessary. What is wanted is only a systematic development of the industry for which Indian technical personnel is available.

12. (3)(4-A). **The availability and the future requirements of technical personnel so as to obtain a clearer indication of the present shortcomings and future needs.**

In order to obtain a continuous flow of trained personnel for the development of the industry, we recommend that technological institutes in India should provide special courses on essential oils and aromatics. Arrangement should also be made for the practical training of essential oil students in Government as well as private owned factories. It would also be advisable to send technically qualified persons abroad for higher training to enable them to keep themselves abreast with the latest development in other countries.

13. (3)(5). **The manner and the degree of co-operation with foreign firms considered necessary and desirable, both as regards capital and management:**

No foreign capital or management is necessary for the development of the essential oil industry of the country.

14. (3)(6). **The location of the industry:**

In view of the varied climatic conditions in India the industry will necessarily have to be located in widely different parts according to the availability of the essential oil bearing plants. For instance, in Cochin and Travancore the Lemon Grass, oil industry and in Mysore State the Sandalwood oil industry are established. Similarly Palma Rosa oil industry will have to be established in C. P. and Khus oil industry in U. P., Punjab and South India. We strongly recommend that the industry be located where raw materials are available in order to reduce the cost of their transport and thus enable the production of the oils at an economic rate.

15. (3)(7). **The nature of assistance required from Government in the form of protective duties, bounties, research grant, expert advice etc.**

We recommend that for the benefit of the soap and perfumery industry, such of the essential oils as are not indigenous to the country and aromatic raw materials which are not growing in the country, as far instance, Patchouli leaves, Citronella grass, cloves, Cinnamon bark etc. be permitted to be imported free of duty as is done in the

United States in respect of Sandalwood. Where, however, raw materials are available in the country and the industry undeveloped the existing import duty should be levied on the imports of both raw materials as well as finished products in order to develop the growth of the Indian industry. We also recommend that a substantial grant for research work be made to the study of a systematic cultivation of aromatic plants in India for which purpose a separate directorate should be established as we have recommended in a previous paragraph.

16. (3)(7-A). **The relative incidence of the import duty on the finished goods in comparison with the duty on the raw materials from which they can be manufactured :**

We have already recommended that there should be no import duty on aromatic raw materials of such essential oils as are not produced in India. In any case the duty on raw materials should be much lower than the duty on finished products.

17. (3)(8). **If the industry is to be under private ownership and management, what controls, if any, should be exercised by Government :—**

In the case of essential oils British Pharmacopoia and their recognised standards should be adopted and enforced.

18. (3)(9). **What should be the organisation of the different units of the industry,** e.g. **should there be an industrial association. Would a cartel be desirable ?**

We do not recommend the formation of any cartel, but when the essential oil industry is developed as Association of the Essential Oil manufacturers may be formed to protect the interests of the industry.

19. (3)(10). **The stages by which the industry should be developed.**

We are of the opinion that the development of the industry should be speeded up simultaneously all over the country.

20. (3)(11). **Should the industry cater for the export market.**

We find that a number of aromatic raw materials are at present being exported, but we recommend that a great impetus be given to the export of oils from these maaterials for which there is a large world market.

21. (3)(12). **Should the industry be developed, as in Japan, on the cottage industry basis, and if so, to what extent :**

Many essential oils are produced at present on a cottage industry basis or in field distilleries by crude methods. The distillation of essential oils needs a thorough chemical and analytical knowledge, which the manufacture on a cottage industry basis may not always be able to provide. We, therefore, favour the further development of the industry on modern lines as in France, Italy, Spain, Bulgaria etc. The cultivation of the aromatic plants may be encouraged in small holdings so as to facilitate distillation in centralised factories under modern conditions. We are in favour of aromatic plants being cultivated and distilled on a co-operative basis.

P. A. NARIELWALA .. *Chairman.*

S. G. SASTRY
S. D. KAPOOR
A. K. MENON
S. A. SALETORE
J. L. SARIN
D. Y. ATHAWALE } *Members.*

K. A. N. RAO .. *Secretary.*

December, 1946.

REPORT ON SOAPS.

The importance of soap in the daily life of the average citizen is too well-established to need any special mention. Soap in the modern sense came into use as a detergent and an article of toilet even in European countries only in the 19th century. Before soaps were known in India, she had her own indigenous cleansing agents of vegetable origin detergents such as "aritha" or soap-nuts, wood ash, "Sikakai", gram flour etc. and saponaceous clays found in river beds and elsewhere. They were in common use as an aid to personal hygiene and even now some of them are in extensive use.

2. In keeping with the general trend of development all over the world, soap was introduced in India from the West in the middle of the 19th century and increasingly became an article of daily use, mostly in large towns. The first soap factory to manufacture soaps on western lines was started in India in 1887 at Meerut by an English manufacturer, and manufacture mostly in small establishments and by comparatively primitive methods soon began to develop. By 1913-14 the production of soap in India was nearly 14,000 tons per annum. The first World War gave an impetus to the soap industry, but no serious well-organised production was developed till after it.

3. The Kerala Soap Institute at Calicut and the Mysore Soap Factory at Bangalore were notable instances of early attempts made under Government auspices. The growing demand for soap in India was being met chiefly by imports (mainly from England) which were valued at more than Rs. 2 crores in 1920-21, and it was not till the late twenties that the first big soap factory was established by private enterprise by the House of Tatas in Cochin. The 1930 Swadeshi movement gave a fillip to the development of the Indian soap industry and an attempt was made at this stage to organise the industry on an All India basis by the formation of the All India Soap Makers' Association at Calcutta. In 1933-34 Lever Bros. of England established the largest soap factory in India and the indigenous production of soap increased to about 43,000 tons per annum whilst the imports fell from Rs. 1·68 crores in 1929-30 to Rs. 78 lacs in 1933-34. This steady progress continued and resulted in a production of about 70,000 tons per annum by 1938-39 with a corresponding decline in the value of the imports to about Rs. 26·8 lacs. India by then was able to manufacture high class soaps of all varieties and plants for recovery and distillation of glycerine had been installed in four factories.

4. The second World War was responsible for a further impetus to the development of this industry in common with others and it was estimated that in 1944 the production of soap in India was about 140,000 tons of which 10% was reckoned to be milled toilet soap. The productive capacity of the industry is, however, estimated at about 160,000 tons per annum. Except for a few large well-organised factories, production is largely carried on in a large number of small establishments all over the country. It is estimated that there are about 120 factories registered under the Factories Act, of which only 48 are members of the All India Soap Makers' Association at present.

5. The present annual production of about 140,000 tons of soap in India works out to 0·75 lb. (12 oz.) per head of population. This is very low compared with some of the other countries where the per capita consumption varies from 15 to 25 lbs. per annum. The use of soap in India is gradually becoming extensive even in rural areas; with the rising living standard, the greater emphasis that is being laid on personal hygiene and public health, the larger number of people who have been accustomed to the use of soap during the war and the wider industrialisation of the country that is being planned, the consumption of soap will increase to a greater extent in the immediate future and in the years to come. We are of the opinion that there is a shortage of soap, particularly of the laundry type, in the country and if additional plant capacity and plentiful supplies of raw materials like oils, fats and alkalies were available we believe the country would have absorbed even a larger production than what was reached during the war.

6. **Directive** 3(1). **The scope and extent of development including the type of products recommended:**

After careful consideration we have come to the conclusion that the first-five year target for the development of the soap industry should be fixed at a minimum of 300,000 tons per annum and it should be apportioned into 3 principal categories as under:

	30,000 tons of toilet soaps.
	15,000 tons of industrial soaps and
	255,000 tons of Household and laundry soaps.
Total ..	300,000 tons

When this target is attained, the per capital consumption will still be only 1·53 lbs. (24·4 oz.) for a population of 440 millions at the end of five years.

To achieve the target as set out above we have considered the different aspects of the industry and we make our recommendations as follows:—

7. The principal raw materials required by the soap industry are (a) oils and fats, (*b*) resin, (c) aklalies, (*d*) common salt, (*e*) fillers, (*f*) essential oils and aromatic chemicals, (*g*) colours; in addition, (*h*) containers for special types of soaps, (*i*) packing paper of all types including straw boards, (*j*) packing cases and (*k*) nails and hoop iron would be necessary.

(*a*) *Oils and fats:* These can be considered under 3 categories: (i) those which may be termed as hard oils, *i.e.* oils and fats of 35-40°C titre consisting of hydrogenated oils, mohua oil, palm oil, hardened fish oil and tallow; (ii) Soft oils of iodine value from 80 to 120 and consisting of such oils as cotton seed, rape seed, groundnut and castor and their soap stocks * and also linseed oil for soft soaps and (iii) cocoanut or palm kernel oil.

* *N.B.* Soap Stock is a technical term to indicate a mixture of soap and oil obtained during the process of refining of oils.

(*b*) *Rosin:* Rosin is the residual product obtained during the distillation of olea resins from pine trees and which contains a high percentage of saponifiable acids, cans be used in considerable proportion with fats and oils in the manufacture of soaps. There are three factories in India producing rosin of desired qualities, and we recommend its wider use in the manufacture of soaps, particularly laundry soap in order to conserve the resources of oils and fats in the country.

The total quantity of oils, fats and rosin required for the target of 300,000 tons of soap is estimated at about 210,000 tons, made up as follows:—

25,000 tons for	30,000 tons of toilet soaps.
10,000 tons for	15,000 tons of industrial soaps.
175,000 tons for	255,000 tons of laundrysoaps.
Total .. 210,000 tons	300,000 tons.

The distribution of approximate quantities of oils and fats into the three categories of soaps is shown below:

(A) *For toilet soaps:*

(i) 11,000 tons of hard oils.
(ii) 7,000 tons of soft oils.
(iii) 6,500 tons of cocoanut or palm kernel oil.
(iv) 500 tons of superior quality resin.

Total .. 25,000 tons.

(B) *For industrial soaps:*

(i) 8,000 tons of soft oils.
(ii) 2,000 tons of resin.

Total ... 10,000 tons

(C) *For Laundry soaps,*

(i) 50,000 tons of hard oils.
(ii) 56,000 tons—46,500 tons of soft oils and soap stocks.
(iii) 43,500 tons of cocoanut* or palm kernel oil.
(iv) 25,000 tons—35,000 tons of rosin.

Total .. 175,000 tons.

(* *N.B.* The total quantity of cocoanut oil required for laundry soap has been estimated on a somewhat restricted basis as we consider that it might not be economical for some parts of India like the Punjab, N. W. F. P., U. P., etc. to use cocoanut oil, without incurring heavy freight charges and especially with a view to the utilisation of other locally available oils which could be substituted for cocoanut oil.)

The total quantity of oils, fats and rosin required will, therefore, be:

(i) 61,000 tons of hard oils (11,000 plus 50,000).
(ii) 51,500—41,500 tons of soft oils (7,000 plus 8,000, plus 56,500—46,500 less 20,000 tons of soap stock (equivalent fatty acids) available from hydrogenation plants and oil refineries in the country).
(iii) 20,000 tons of soap stock (equivalent of fatty acids) expected to be obtained from 400,000 tons of hydrogenated oils.
(iv) 50,000 tons of cocoanut or palm kernel oil (6,500 plus 43,500).
(v) 27,500—37,500 tons of rosin (500 plus 2000 plus 25,000—35,000).

Total .. 210,000 tons.

(c) *Caustic Soda:* We estimate that 42,000 tons of 96/98% caustic soda including a small quantity of caustic potash would be required on the following basis:

(i)	5,000 tons for	30,000 tons of toilet soap.
(ii)	37,000 tons for	270,000 tons of industrial and laundry soaps.
Total ..	42,000 tons	300,000 tons.

We understand that the Heavy Chemicals Panel has taken this requirement of the soap industry into consideration in fixing the target for caustic soda production in the country.

At present almost the entire requirement of caustic soda for the soap and other industries is imported principally from England, and whilst we welcome the projected production in the country, we believe and emphasise that until the production is developed in India, an unrestricted import of Caustic Soda should be permitted till such time as India becomes self-sufficient.

(*d*) *Salt :* We estimate that 21,000 tons of salt of not less than 90% purity will be required. This forms the upper limit and we expect the actual consumption to be much less since cold process soap requires no salt, semi-boiled process soap a smaller proportion and factories having glycerine recovery plants a still smaller quantity. We understand that the salt as is supplied at present to the soap industry is not, in some places, of the required standard of purity. We are of the opinion that salt of as high a purity as possible and having 96-98% NaCl should be produced and made available not only to the soap industry but to all industries which consumed salt as the purer the salt the less will be the quantity required. We also recommend that for all industrial uses salt should be supplied free of duty all over India ; we understand the present practice regarding exemption from duty is not uniform as duty is being charged in some areas and not in others.

(*e*) *Fillers :* We are generally averse to the use of fillers in soap ; invariably they are added, as its name suggests, to add weight to the soaps and not for any intrinsic detergent property. We understand that soap stone, which is a cheap material, is being used in appreciable quantities as a filler ; we are discouraging its use as it tends to reduce the quality of soap and deceive any unwary customer. Looking, however, to the present stage of the soap industry in India and the leeway it has to make and also taking into consideration the importance of conserving the resources of the country in the principal raw materials of the industry *viz.*, oils and fats, we are agreeable to permit the use, but to a strictly restricted extent, of such soap fillers as possess definite detergent properties, in laundry soaps only. They are sodium silicate, sodium carbonate, trisodium phosphate, borax and bentonite-like clays. In our opinion no more than 5-7% of fillers should be allowed to be used, the maximum margin being only 7% (see para. on "Standards"). We do not anticipate the Indian soap industry will have difficulty in obtaining the supply of the necessary quantities of fillers.

(*f*) *Essential Oils and aromatic chemicals :* These materials are desirable and necessary adjuncts of the soap industry. We estimate the total requirements of these at 1,360 tons per annum on the basis of :

600 tons	for	30,000 tons of toilet soap (about 2%).
760 tons	for	255,000 tons of laundry soap (about 0·3%).
Total .. 1,360 tons	for	285,000 tons.

(*i*) *Toilet Soaps :* We consider that the quantity of 600 tons required for toilet soap can be made up of :

(*a*) 400 tons of essential oils.
(*b*) 200 tons of aromatic chemicals.

Total .. 600 tons.

The principal essential oils suitable for use in toilet soaps are lemon grass, citronella, palmarosa, sandalwood, khus, patchouli, eucalyptus, cinnamon leaf, geranium, orange, lemon, linaloe, apike lavender, lavender, cedar wood, neroli, clove etc.

(ii) *Laundry soaps:* We are of the opinion that for this category of soap, the proportion of essential oils to aromatic chemicals would be 60 : 40. On this basis

(*a*) 460 tons of essential oils.
(*b*) 300 tons of aromatic chemicals.

Total .. 760 tons would be needed. Again for laundry soap only cheap oils like lemon grass, cintronella and pine needle would be all that is necessary. Since neither citronella nor pine needle oil is produced in India at present, we recommend that as far as possible only Indian oils like lemon grass should be used. Even though pine needle oil is not available at present, we suggest that the possibility of its manufacture should be examined as the raw material is available in the country.

In all, therefore,

(*a*) 860 tons (400 tons plus 460) of essential oils.
(*b*) 500 tons (200 plus 300) of aromatic chemical.

Total .. 1360 tons would be required annually by the soap industry.

As regards those essential oils which are not produced in India, we are of opinion that they should be permitted to be imported free of duty. In certain cases, however, *e.g.* cinnamon, vetivert, clove and patchouli, it would be profitable to import duty free the raw materials themselves from other countries and distil the oils in India.

With regard to aromatic chemicals for household and laundry soaps only cheap chemicals are necessary but very few of them are available in India. Terpineol would be very suitable and if it can be produced in India at a cheap rate it would find a large internal market. Cresylic and carbolic acids would also be required in appreciable quantities. For the toilet soaps, however, aromatic chemicals of a number of varieties and of superior quality would be needed and these will have to be imported for a considerable period and at any rate until the aromatic chemical industry is developed in India. We may, however, clarify that we are not in favour of encouraging ready blended perfumes for the use of the soap industry. We believe that until the aromatic chemical industry is established every encouragement should be given to the blending of such chemicals into suitable perfumes in the country itself and we recommend that a higher custom duty be levied on the imports of ready made perfumes than on aromatic chemicals. We are aware of the backwardness of India in the blending of perfumes and we are of the opinion that every form of encouragement be given to foster the development of a perfume blending industry in the country.

(*g*) *Soap colours:* On the basis of 0·05% on the weight of soap, about 15 tons of soap colours would be necessary. As no dye industry exists in India, we fear that these colours will have to be imported from abroad for some time to come.

(*h*) *Containers:* We have examined the question of supply of galvanised iron containers or wooden barrels for soft soap, dispensers for liquid soap, bakelite or aluminium containers for shaving sticks and bowls or cups for shaving cream. Since no data are available as regards their probable requirements, we do not think any useful purpose would be served by trying to estimate them with any accuracy. Since, however, the quantities required would not be very large, no difficulty may be anticipated in obtaining them.

(*i*) *Packing paper and straw boards:* Most toilet soaps and some types of household and laundry soaps require different types of wrapping and printing paper for wrappers as also boards for cartons. The quantities required are estimated as

given below though it is not possible to allocate them separately with any degree of accuracy, for house-hold and laundry and toilet soaps.

(i) Wrapping paper of grease-proff type such as butter paper, cellophane or waxed paper	600 tons
(ii) Paper of non-grease-proof type, such as kraft paper, printing paper and other types	400 tons
(iii) Straw boards, paste boards and other types of boards ..	2500 tons
Total ..	3500 tons

As grease-proof and cellophane type papers are not yet manufactured in the country the soap industry would have to depend on its supplies from foreign sources. Kraft and printing papers are being made in India and as regards straw boards, pasteboards etc., we understand that during the war their manufacture has also been started and we do not anticipate the soap industry will experience any difficulty in obtaining its requirements from Indian sources.

(*j*) *Packing Cases:* As an article of commerce soap needs wooden packing cases not only for its transit from place to place but also for its preservation and storage. We reckon that 50 c. ft. (1 ton) of timber would be needed for packing 2·3 tons of toilet soap or 4 tons of laundry or household soap. On this basis the soap industry would need:

(i) 650,000 c. ft. or 13,000 tons of timber for 30,000 tons of toilet soap.
(ii) 3,200,000 c. ft. or 64,000 tons for 255,000 tons of laundry and household soap.

3,850,000 c. ft. or 77,000 tons of timber for 2,85,000 tons of soap.

Since, however, many of smaller manufacturers and particularly the cottage soap makers would utilise second hand cases, we do not expect that the demand for timber would be more than 3,000,000 c. ft. or 60,000 tons per annum. For the preparation of packing cases, the timber would be needed in cut planks of $\frac{1}{2}$" to $\frac{5}{8}$" thickness. Since it is understood that there is a shortage of soft wood for packing cases in India we recommend the import of soft wood from wherever possible in planks or cut to size shooks. It is also likely that other packing materials will be developed as substitutes for timber such as containers made of corrugated or plain card-board, bamboo or tough varieties of grasses and composition boards and their use should be encouraged wherever possible for the conservation of our timber resources.

(*k*) *Nails and Hoop Iron:* As a corollary to packing cases, the necessity for nails and hoop iron will be obvious but it is difficult to estimate the quantity that will be required of these articles. Roughly about 1000 tons of nails and 1500 tons of hoop iron will be necessary.

8. (3)(1-A.) **The estimated requirements of capital goods together with such details of these requirement as may be available in India and how much should be imported from abroad.**

A modern soap factory should, for efficient working, include the following special equipment in addition to a boiler and the usual mechanical and electrical accessories:—

Kettles or pans, crutching machines, soap cooling presses and/or frames, slabbing and cutting machines, chipping machines, drying plants, perfume mixers, milling

machines, plodding machines, stamping machines, wrapping machines, box-making machinery and glycerine recovery and distillation plants.

Of the existing potential plant capacity of 160,000 tons of soap per year, we believe that 16,000 tons would comprise of toilet soaps and 144,000 tons of household and laundry and other types of soaps, against which, as previously stated, the present production is only 140,000 tons made up of 14,000 tons of toilet soap and 126,000 tons of other types of soap (mostly household and laundry).

(*i*) *Toilet Soaps:* To reach the target of 30,000 tons of toilet soaps the extra production capacity to be provided for would be 14,000 tons (30,000 minus 16,000) per year. We are of the opinion that a 300 ton-per-annum plant is the minimum economic unit for toilet soap, and we recommend that the development of the additional capacity be distributed on the following basis. In making this recommendations we have been largely guided by the size of the country, and equitable distribution of the plants in the various provinces and the avoidance of the development of a few very large plants to the detriment of the smaller manufacturers. On the other hand, it is not to be understood that the upper limit is restricted to plants of 1000 tons per annum capacity; plants of 5000 tons per-annum capacity would, in our opinion, be a suitable upper limit for a country of distances like ours.

Number of units.	Capacity of each unit per annum.	Total capacity per annum.	Estimated capital cost of imported equipment.
20	300 tons	6,000 tons	Rs. 20,00,000
10	600 tons	6,000 „	Rs. 15,00,000
2	1,000 „	2,000 „	Rs. 5,00,000
32		14,000 „	Rs. 40,00,000

* (*N.B.* In the estimated capital cost provision is made only for the following equipment: Mixers (amalgamators), chipping machines, milling machines, cabinet driers, plodders and stamping machines.)

Though we have provided for twenty 300-ton units we should like to observe that it may be uneconomic for such plants to make their own soap base as they may not be able to compete with larger units and particularly those equipped with glycerine recovery plants. We are, therefore, of the opinion that these units should preferably obtain their soap base from larger plants, unless, of course, these units are attached to plants making laundry and household soaps. Such a policy will be beneficial to the country and the industry as a whole in maintaining a uniform standard of quality.

(ii) *Household and Laundry soaps:* Out of the 126,000 tons of household and Laundry soaps being manufactured at present, we estimate that about 60,000 tons are of standard quality produced in large organised factories and the balance in small units on a cottage industry scale. We are of the opinion that out of the total production target of 255,000 tons, not more than 85,000 tons should be permitted to be manufactured in small scale units not coming under the Factories Act, the balance of 170,000 tons being reserved for manufacture in large scale factories. As has been observed in the previous paragraph there is at present a surplus production capacity of about 18,000 tons in Household and laundry soap plants, the extra production capacity to be arranged for in organised factories would, therefore, be 92,000 tons (170,000 minus 60,000 minus 18,000) per annum.

Though we are of the opinion that an economic unit of a household and laundry soap plant, after taking into account glycerine recovery etc. should be a 5,000 ton-per-year plant, nevertheless, from the point of view of equitable distribution of plants amongst the various provinces of India and also with a view to encourage the use of soap on a wider scale, we are prepared to recom nend the installation of much smaller units—the lowest unit, however, should not be less than 1,200 ton-per-year. As in the case of toilet soaps, we have provided for small, medium and large scale plants, and to reach the target we have aimed at we recommend the installation of the following units:

Number of units.	Capacity of each unit per annum.	Total capacity per annum.	Estimated capital cost of imported *equipment.
25	1,200 tons	30,000 tons	Rs. 7,50,000
9	3,000 ,,	27,000 ,,	Rs. 22,50,000
7	5,000 ,,	35,000 ,,	Rs. 49,00,000
41		92,000 ,,	Rs. 79,00,000

* *N.B.* All the capital equipment required for the 1,200 ton units can be manufactured in India except for the steam boilers and accessories, which it will be necessary to import. Later, perhaps, boilers of Indian manufacture will become available. For the medium sized 3,000-ton units we have provided cooling presses, driers, automatic stamping machines and crude glycerine recovery plant while the 5,000-ton units would require in addition glycerine distillation plants also.

The total value of imported capital equipment for both the Toilet and Laundry soap factories would thus be 40 plus 79 lakhs *i.e.* Rs. 119 lakhs, and allowing 10% for unforeseen expenses such as rise in prices etc. and 10% for other contingencies, we estimate the total cost at Rs. 1·43 crores or 1·5 crores. We should also make it clear that this estimated cost is approximate and has reference to current trends only.

9. *Glycerine:* If glycerine were recovered from all the soap manufactured in India at present, about 7,000 tons of glycerine could be obtained. The present output of glycerine in India is about 2,500 tons and this is restricted to only four of the large organised factories in the country. Similarly, for the projected soap production of 300,000 tons per annum in the next five years the total quantity of glycerine theoretically available would be about 15,000 tons per annum. We are, however, of the opinion that the five-year target for glycerine should be only 5,500 tons per year; of the the present production is 2,500 tons and the balance to be produced is 3,000 tons. We are restricting this production only to the medium and the large sized laundry soap plants. The cost of the glycerine plants, both recovery and distillation units, would be as under:

(i) 9 Recovery plants for 3,000-ton units at Rs. 60,000 each	Rs. 5·4 lakhs
(ii) 7 Recovery plants for 5,000-ton units at Rs. 1·5 lakh each	Rs. 10·5 lakhs
(iii) 10 Distillation plants each of 400 tons capacity (500 ton crude) at Rs. 1·5 lakhs each	Rs. 15·00 lakhs
Total ..	Rs. 30·90 lakhs
Say 31 lakhs.	

This amount has already been included in the estimated capital cost of laundry soap plants.

10. 3(2). **Whether the industry should be under Government ownership either on grounds of national interest or because private capital is unlikely to take it up, and if so whether it should be wholly or partly managed by Government.**

We are of the opinion that this industry should be entirely under private ownership and it is not necessary to have the Government to manage it either wholly or partly.

11. 3(3). **In the case of industries to be developed other than under State ownership, the capital required for such development, whether the whole of it is likely to be available by public investment and if not, the extent to which Government assistance may be required.**

We are of the opinion that the capital required for the development of the industry could and is likely to be made available by public investment only. We do not think that Government assistance would be required in raising the necessary capital for either equipment or finishing the industry.

12. 3(4). **The extent to which technical advice from abroad would be necessary.**

We do not think that technical advice from abroad is necessary for the development of the industry. Some of the organised factories that are in operation at present under Indian management are, as far as our information goes, run entirely by Indian technical personnel.

13. 3(4-A). **The availability and the future requirements of technical personnel so as to obtain a clearer indication of the present shortcomings and future needs.**

With training facilities that already exist in the country and which can be easily expanded it should be possible to increase the number of trained techinical personnel for expansion of the soap industry. We are also of the opinion that arrangements should be made with the large organised factories in the country for practical training of five students each year from technical institutions in India. We understand that the Tata's factories are already taking apprentices for training as soap technicians and this practice should be more widely encouraged. We also recommend that Government must make suitable arrangements for the training each year of ten Indian students in foreign countries in the manufacture of soap and recovery and distillation of glycerine. These students should have necessary technical qualifications and factory experience.

14. 3(5). **The manner and the degree of co-operation with foreign firms considered necessary and desirable, both as regards capital and management.**

We do not consider that any foreign capital or management is necessary in the soap industry. In fact we are of the emphatic opinion that the strongest possible pressure be brought on India (Ltd.) Companies run with foreign capital and management to liquidate their foreign resources and they should be compelled to use Indian capital and bring in Indian control and management if they wish to continue their manufacturing operations in India.

15. 3(6). **The location of the industry.**

We have given careful consideration to the question of location and equitable distribution of the new factories in various parts of India. Our enquiry revealed that at present, the biggest concentration of the soap industry is in the areas of Calcutta and Bombay with the Karachi area coming a close third. In order that the future factories are more evenly distributed and also taking into account the higher standards of living in better industrial areas like those of Calcutta and Bombay, we recommend the following locations: In allotting the new plants, we recommend that Government should give preference to the development of the industry in backward areas.

Location.*	Existing production capacity per month.	Total production recommended per month.	Extra production required per month.
Bombay area ..	4,000 tons	6,500 tons	2,500 tons
Karachi area ..	3,000 „	5,000 „	2,000 „
Calcutta area ..	4,000 „	6,500 „	2,500 „
U. P. area ..	1,000 „	3,500 „	2,500 „
Madras area ..	1,300 „	3,500 „	2,200 „
	13,300 tons	25,000 tons	11,700 tons

* *N.B.* Bombay area .. Bombay Presidency, parts of C. P., Hyderabad and Deccan States.

Karachi area .. Sind, Punjab, Rajputana States and N. W. F. P.

Calcutta area .. Bengal, Assam, a part of Bihar and a part of C. P.

U. P. area .. U. P., Delhi, C. I. States and a part of the Bihar and a part of C. P.

Madras area .. Madras Presidency, Orissa, a part of Hyderabad, Mysore and other Southern India States.

16. 3(7) **The nature of assistance required from Government in the form of protective duties, bounties, research grant, expert advice, etc.**

We recommend that:

(i) the present duty on all soaps should continue.

(ii) in view of shortage of fats and oils, soap substitutes and synthetic detergents that complete with soaps are already being imported in India and as their imports are likely to increase, a higher import duty should be levied on them in order to safeguard the interest of the indigenous soap industry.

(iii) in view of the existence of a large number of soap factories in India and the likely development in the next five years, the fabrication of soap machinery in India itself should be undertaken. To meet this end, we further recommend that Government should grant a subsidy to established firms who under-take the manufacture of good quality soap equipment such as plodders, soap driers, automatic stamping machines, milling machines, glycerine plants etc.

(iv) grants for research on and semi-commercial production of essential oils and aromatic chemicals be made on a liberal and adequate scale to the Essential Oil Advisory Committee of the Council of Scientific & Industrial Research and other Research Institutions.

17. 3 (7-A). **The relative incidence of the import duty on the finished goods in comparison with the duty on the raw materials from which they can be manufactured.**

We recommend that the import duty on such essential oils, aromatic chemicals and fattly oils as are not produced in India should be lower than the duty on soap; this would help the Indian soap industry in meeting foreign competition.

18. 3 (8). **If the industry is to be under private ownership and management, what controls, if any, should be exercised by Government.**

If the soap industry in India is to be developed on sound lines it should follow rigid standards of quality in order to inspire confidence in the consumers and to protect them from unscrupulous manufacturers and importers. We therefore strongly emphasise the laying down and the enforcement of rigid standards and controls. The industry should be based on maintaining the highest standard of purity and we recommend that for household and laundry soaps the fatty anhydride content of 60-62% should be fixed as the accepted standard. But in view of the shortage of fats and the low purchasing power of the people, we recognise the necessity of slight relexation in the standard for some time to come and we recommend that where soaps are manufactured by the boiled and settled or semi-boiled process, in factories registered under the Factories Act, soaps of fatty anhydride content of not less than 55% might be permitted to be manufactured for sale by use of carefully chosen fillers of recognised detergent properties as stated in para. 7 and such soaps should bear the stamp of their fatty anhydride content. We are not agreeable to the use of any fillers in the manufacture of milled toilet soaps, the standard for which we recommend be laid down as 78-82% fatty anhydride.

In order to enforce this standard we recommend that suitable steps be taken; these may be in the direction of licensing of factories, demanding an undertaking for following the standards, periodical visits by recognised inspectors and chemical examination of their products and such other steps as are generally taken for the enforcement of Pure Food laws. Some steps are also indicated for controling the advertisements of soaps, particularly where manufacturer and importers make extravagant claims about the quality and usefulness of their products.

19. 3 (9). **What should be the organisation of the different units of the industry,** e.g. **should there be an industrial association. Would a cartel be desirable.**

We have given thought to both these questions. On the first question we find that the industry already has an Association known as the All-India Soap Makers' Association at Calcutta. We also understand that regional associations have been independently formed in Bombay and South India. In view of the large size of the country and the wide distribution of the industry, we believe that there is considerable scope for re-organisation and improvement in the All India body and it should be urged and encouraged to set up Regional Associations, affiliated to the All-India body to look after the interest of the industry in their respective regions. On the second question we have no hesitation in saying that no cartel is necessary or desirable and in fact every attempt to form a cartel should be not only discouraged but put down.

20. 3 (10). **The stages by which the industry should be developed.**

We are of the opinion that the development of the industry should be simultaneous all over the country, but preference must be given to the development of the backward areas.

21. (3-11). **Should the industry cater for the export market.**

We find that a small quantity of soap is being exported at present to the Far Eastern and Middle Eastern countries. We are of the belief that a satisfactory export trade can be developed to a considerable extent. We therefore recommend that Government should give all support for the development of an export market in soaps as well as glycerine, without neglecting the needs of the Indian markets, to countries like China, Burma, Afghanistan, Iran, Iraq, East Africa, Egypt, Federated Malay States and Thailand.

22. (3-12) **Should the industry be developed as in Japan, on the Cottage industry basis and if so, to what extent.**

The term "cottage industry" as is applicable in Japan is very different from what is generally understood in India. In Japan, the cottage industry is in fact a distribution of unit for assembly and marketing. Further, electric power is freely used in all cottage industries in Japan. In India, however, cottage industry generally means complete operation with manual labour often in a crude manner on a comparatively smaller scale. In the case of soap industry, for example, it is well known that soap is made by cold process in Indian homes, the whole family contributing its labour. There is a limited scope for the continuance of the soap industry on this basis. The present quality of cottage soaps admits of considerable improvement in the method of manufacture, particularly in the use of correct proportion of raw materials and the method of operational details. A generous margin of 85,000 tons of soap as a share for the cottage industry has been allotted by us in our target and any future increase in this quantity can only be justified if the cottage soap shows improvement in its quality, method of manufacture and in every other respect.

Sd. P. A. NARIELWALA .. *Chairman.*

S. G. SASTRY,
A. K. MENON,
S. A. SALETORE,
S. D. KAPOOR,
D. Y. ATHAWALE
J. L. SARIN, } *Members.*

K. A. N. RAO, .. *Secretary.*

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